

MODERN REFRIGERATION

AND AIR CONTROL

Vol. 64 No. 755

FEBRUARY, 1961

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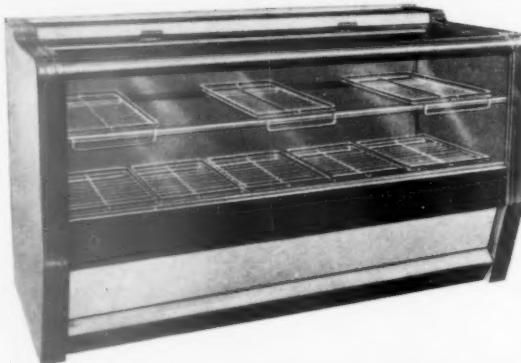
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'THERMOCAL' DF sets a new standard of corrosion-resistance—with a corresponding (and profitable) reduction in plant maintenance and stoppages.

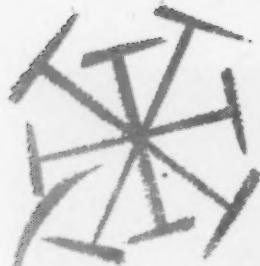
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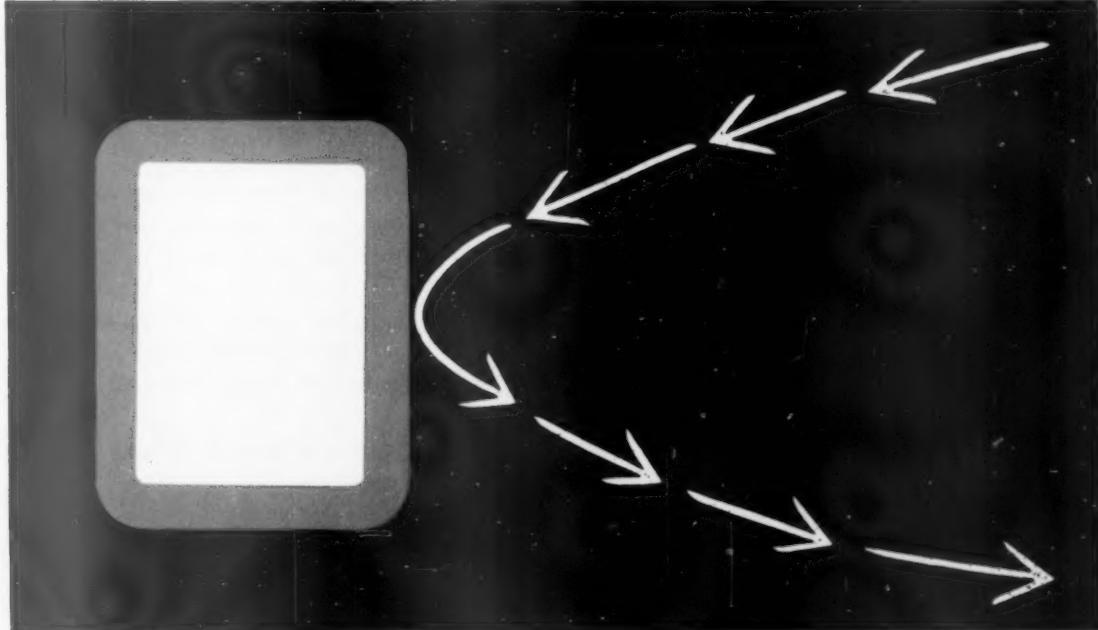
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This Triol is specifically designed for the manufacture of rigid polyether urethane foams for use as insulation materials. They offer:

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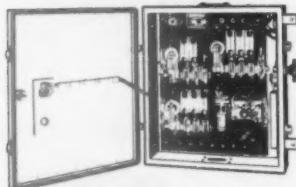
Applications include, insulation for domestic refrigerators, deep freezers, refrigerated transportation equipment and other applications where a rigid, low-density foamed-in-place urethane polymer is required. Contact us for full technical and commercial data.



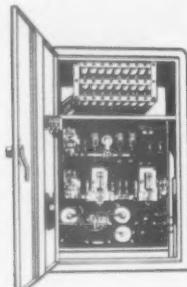
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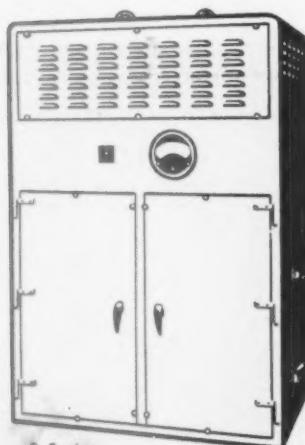
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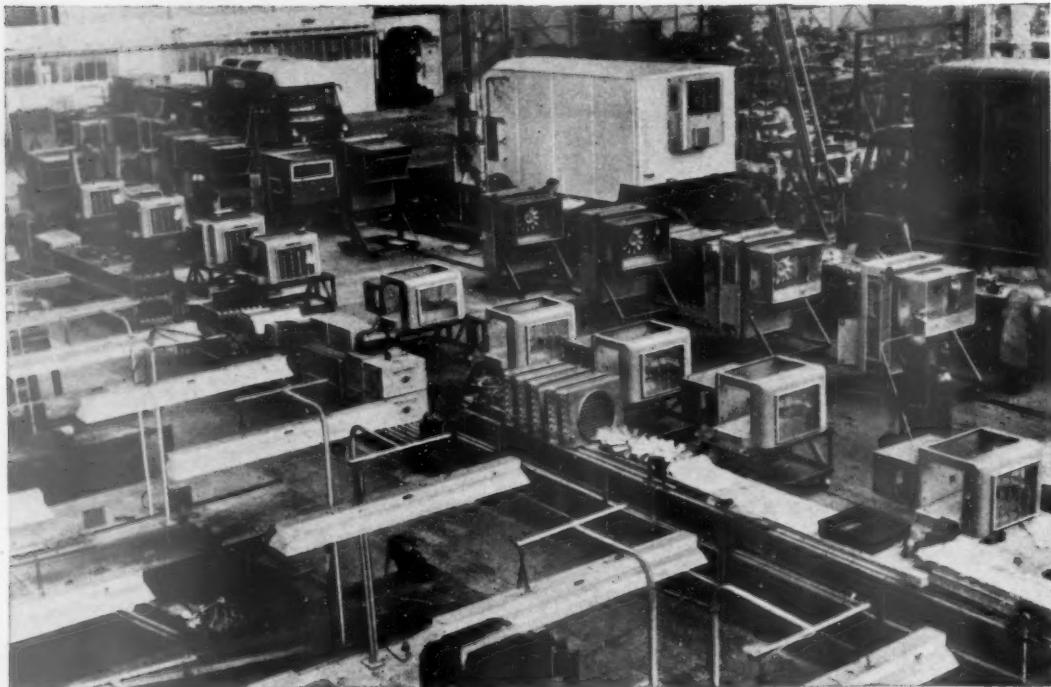
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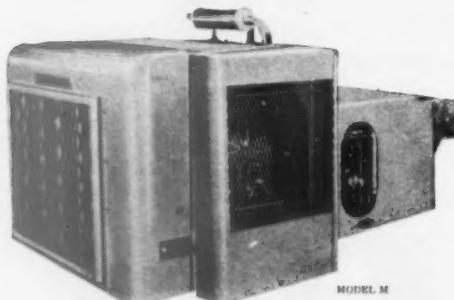


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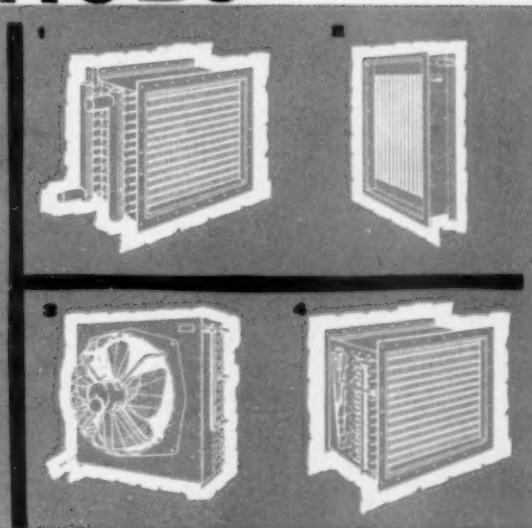
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You earn important savings with a Tiny-T model compressor . . . less cost, less weight, less size than previous single cylinder internally spring mounted compressors.

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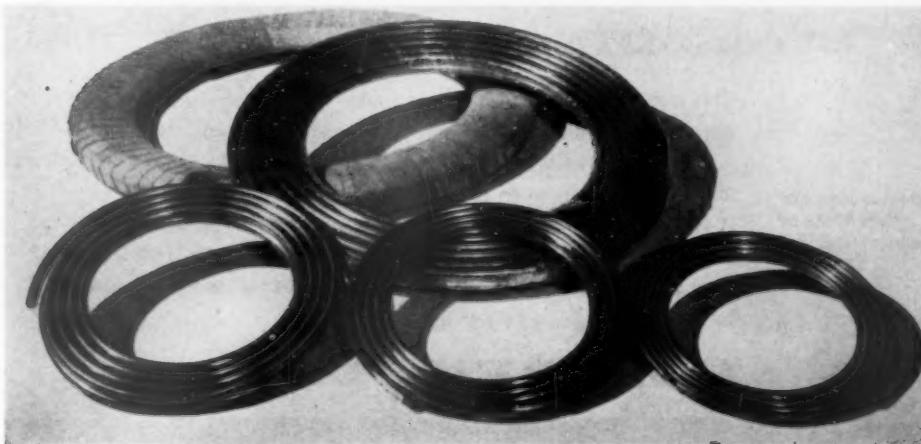
*Refrigerator
Tubes
ensure a
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When you order *Yorkshire Imperial* you are assured of high-quality refrigerator tubes with clean, smooth bores, dehydrated, and delivered in sealed coils of the correct temper. They are double-wrapped and will remain in first-class condition until you are ready to use them.

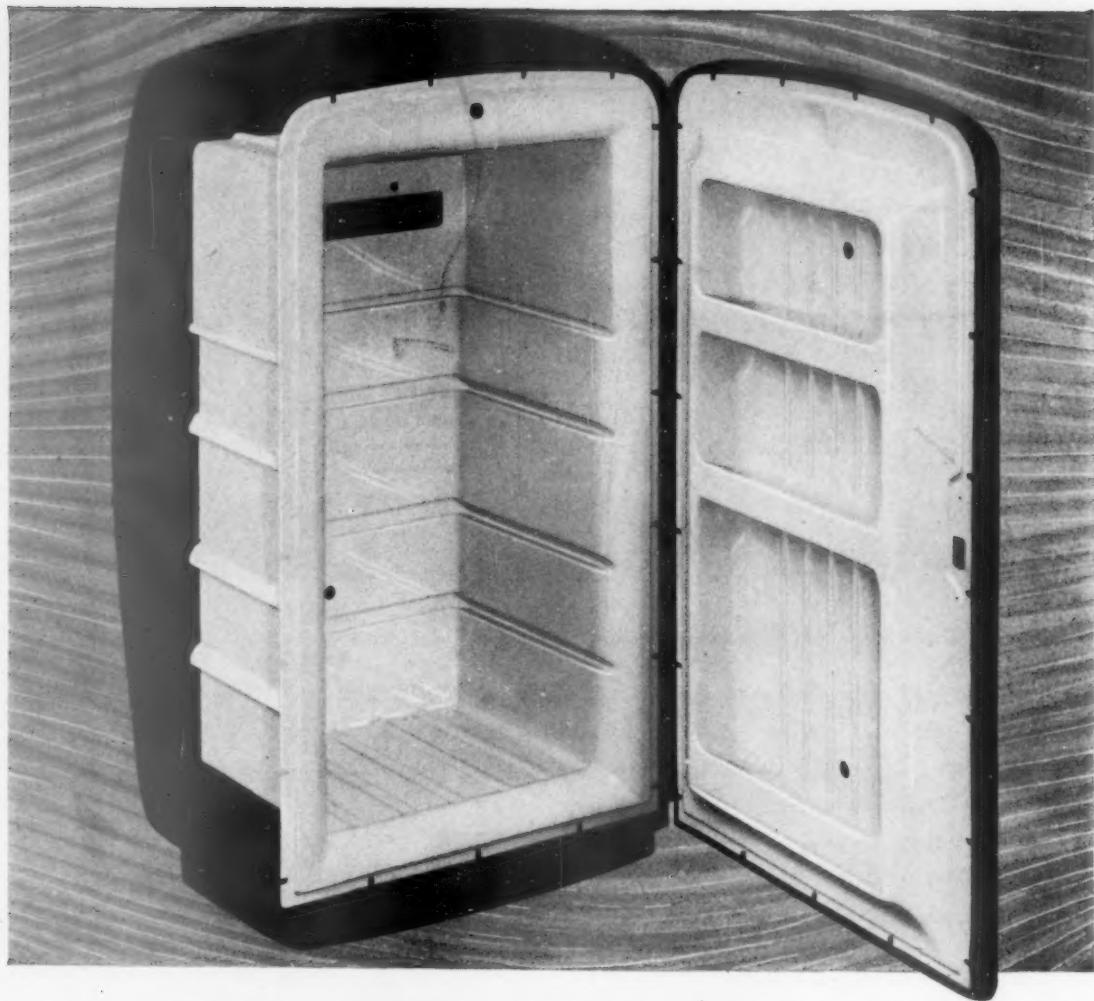
The tubing is coiled in double pancake coils in 20 ft., 50 ft. and 100 ft. lengths—or supplied in straight lengths—and when required can also be tinned on the outside.

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Refrigerator inner and
door lining by
Thermoplastics Ltd
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BEXTRENE Sheet

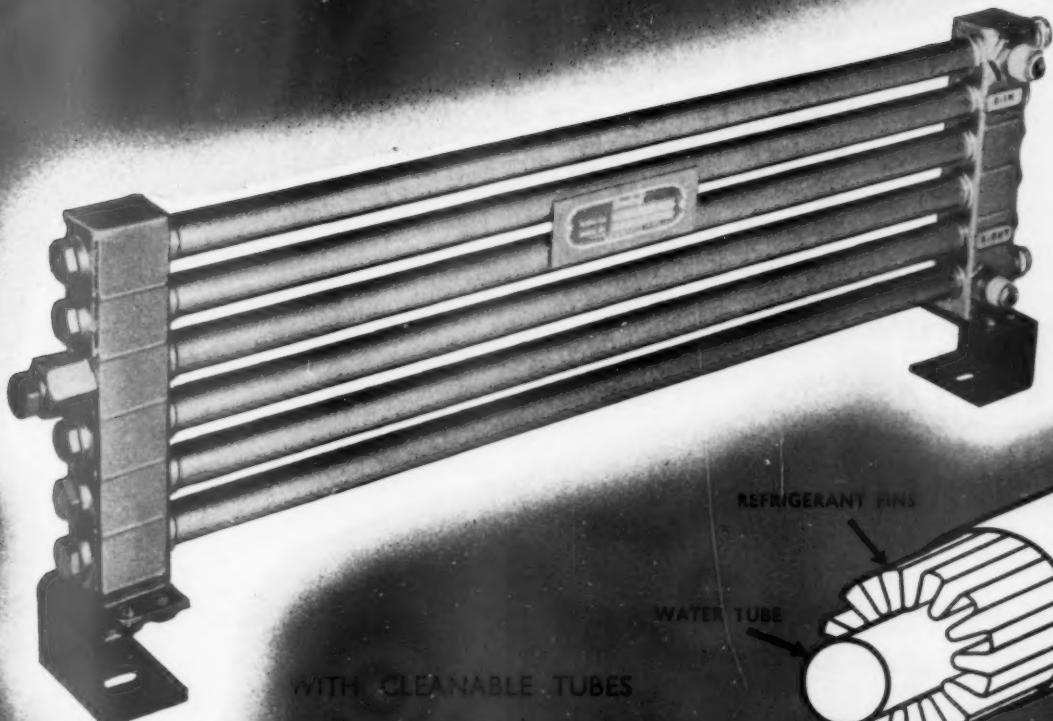
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heat-x

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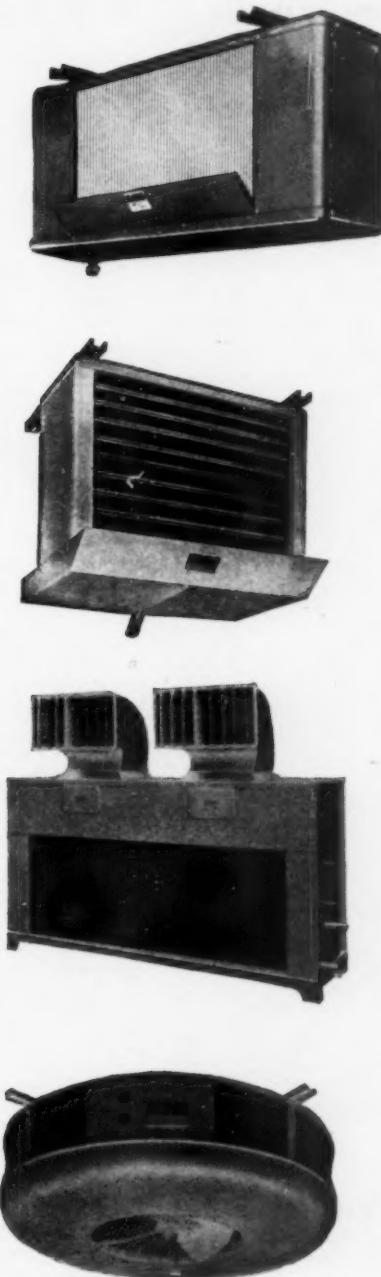
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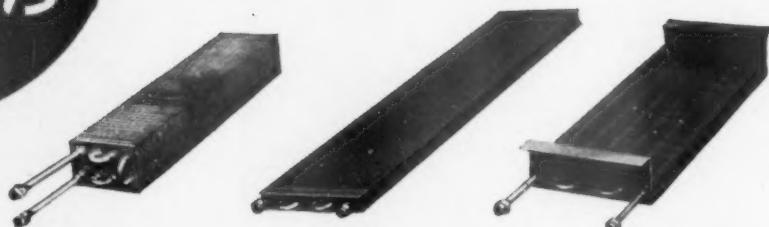
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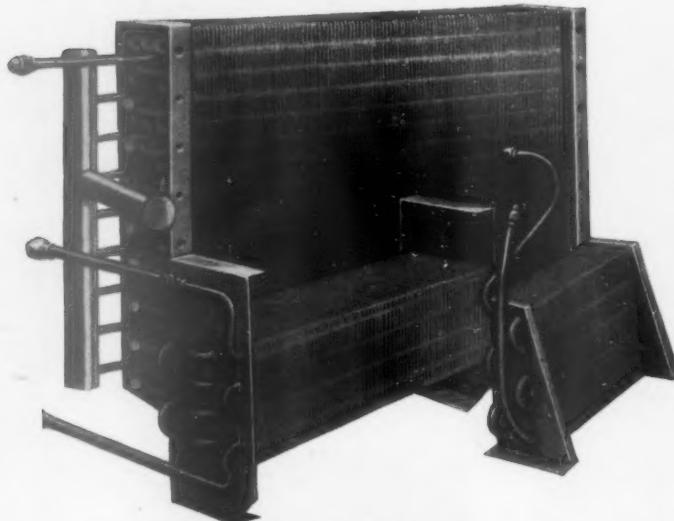


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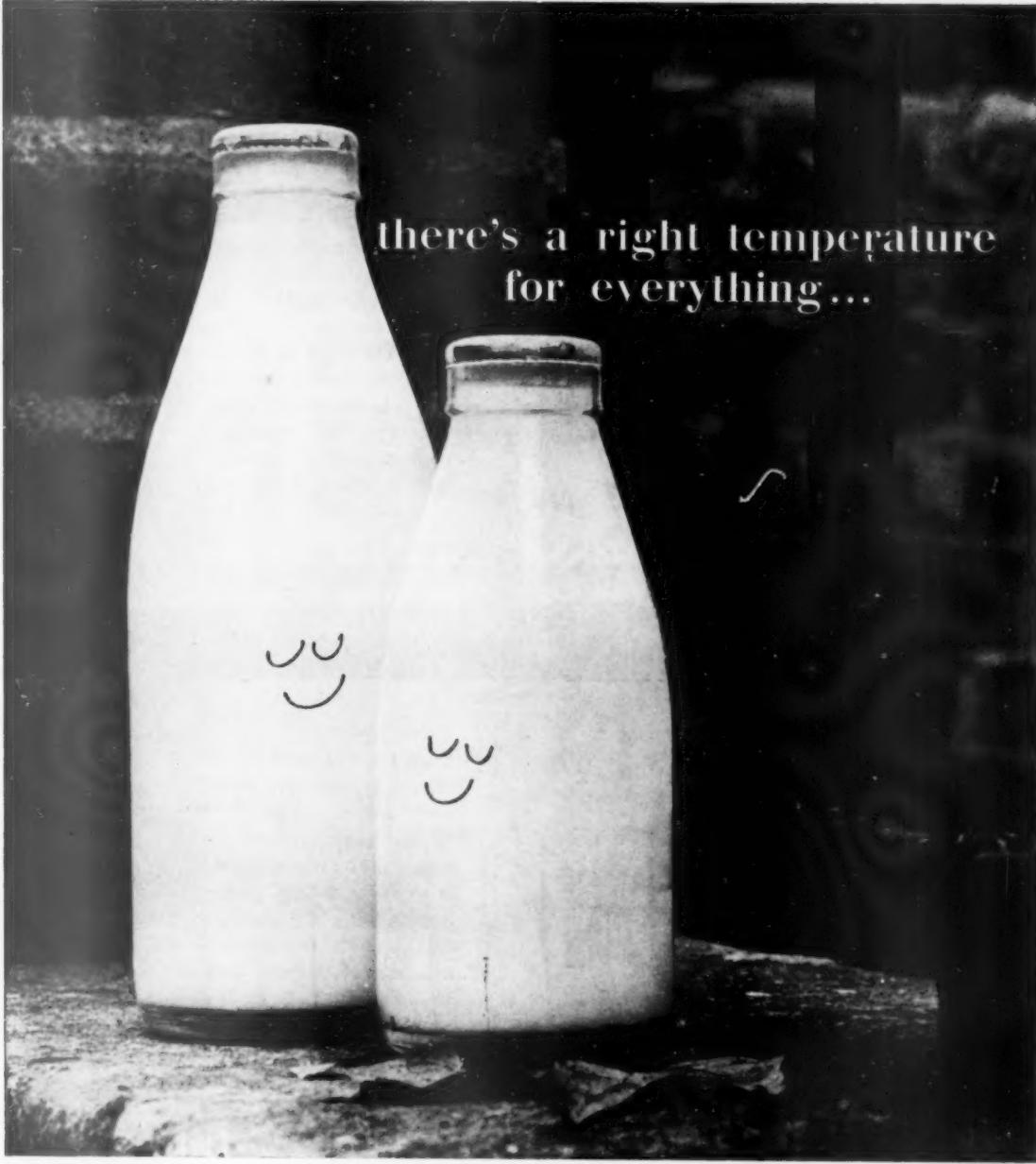
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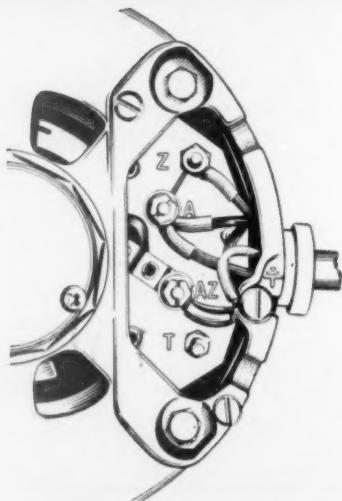


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This thing called know-how



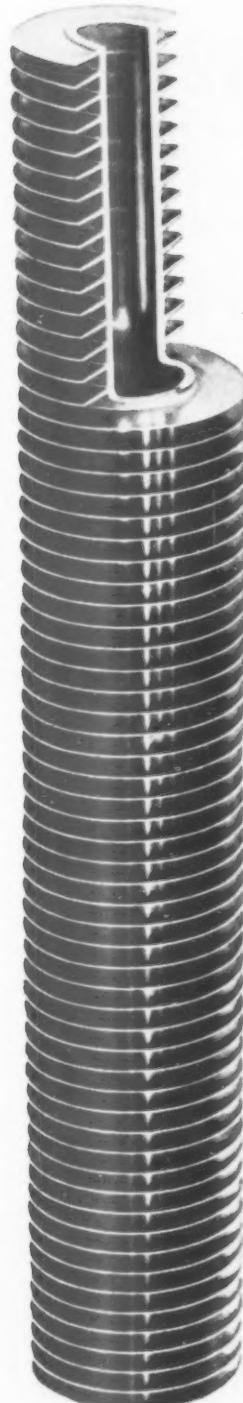
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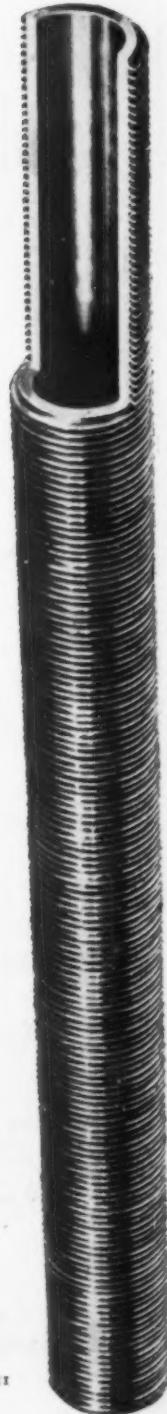
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INT. II

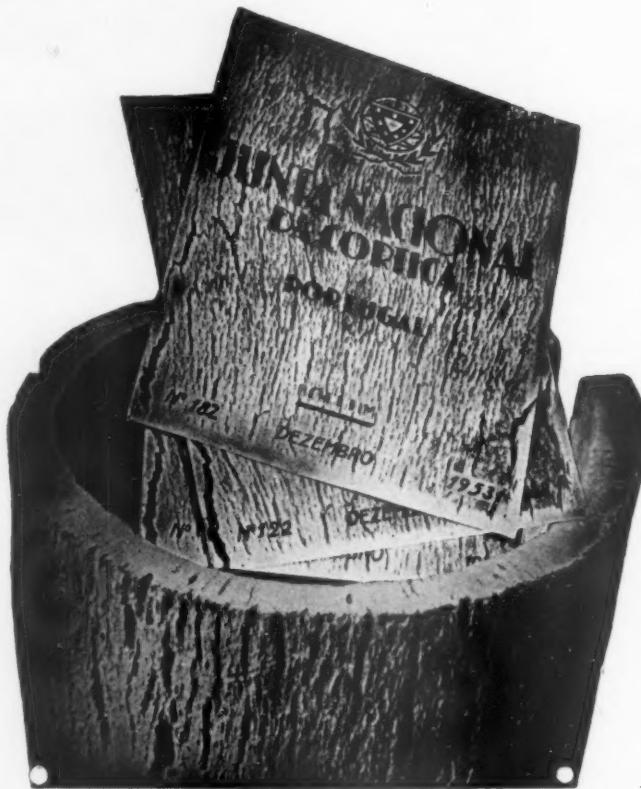


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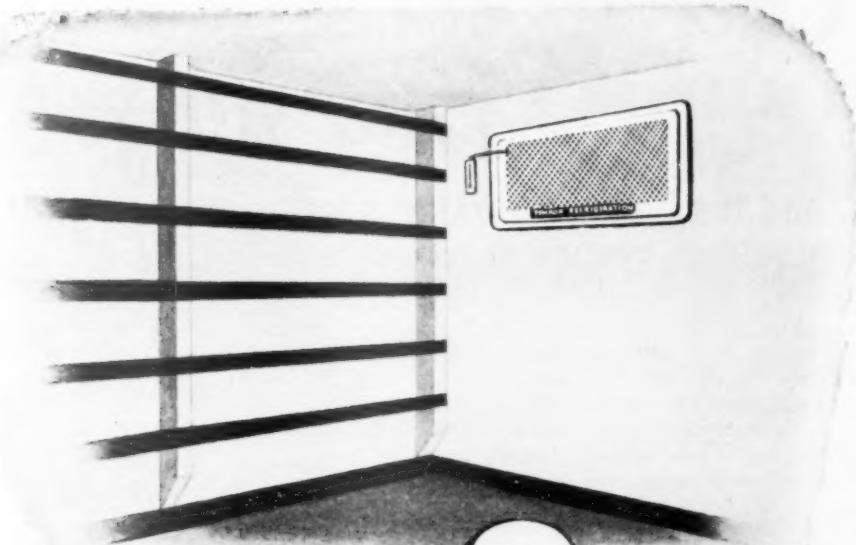
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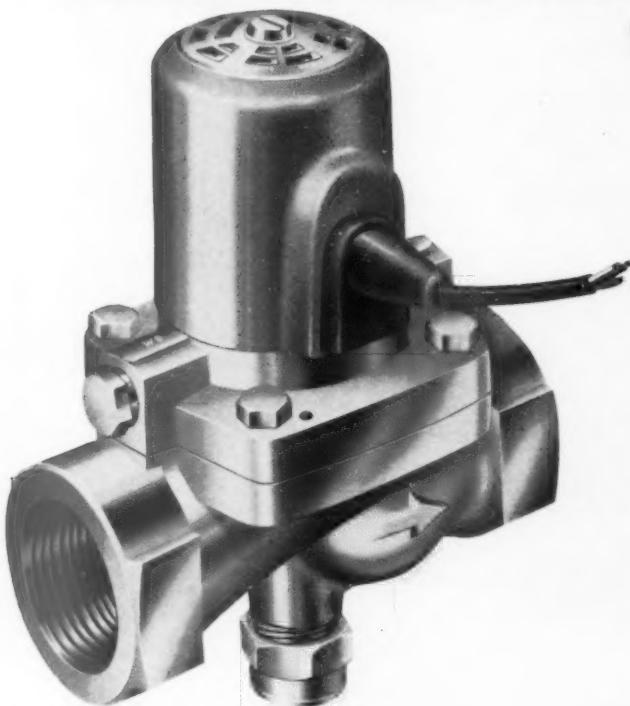
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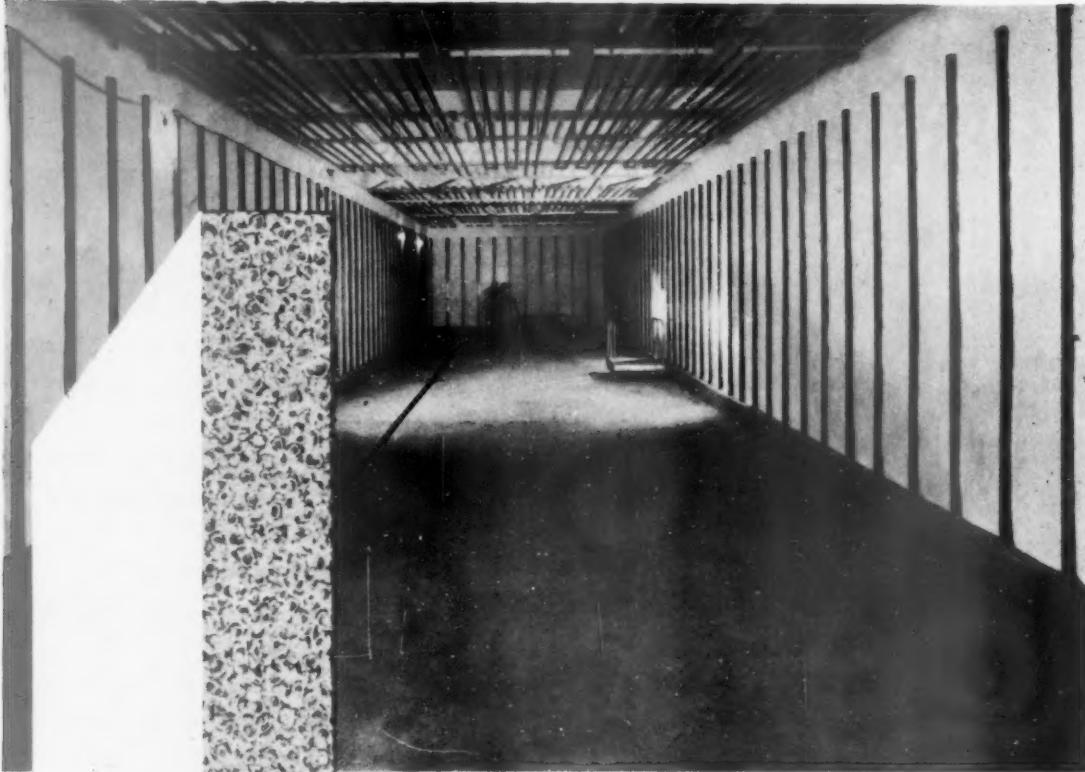
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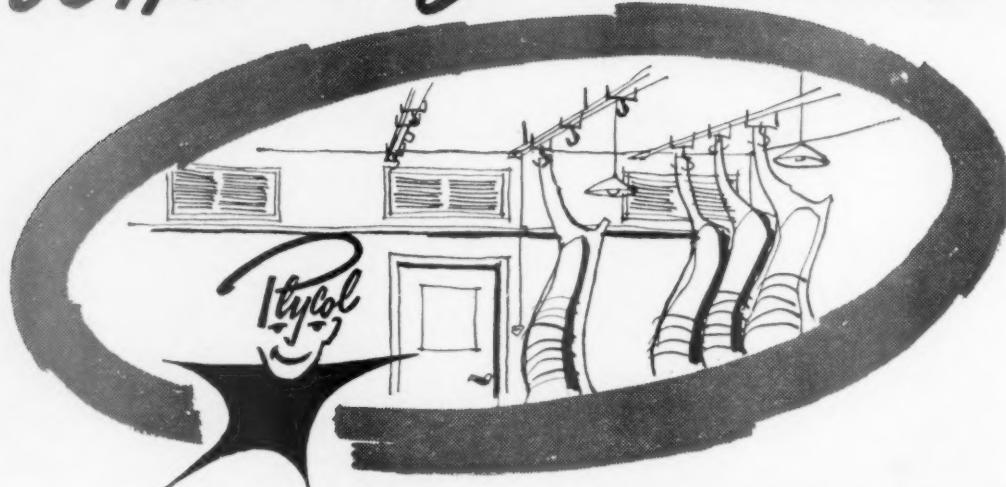
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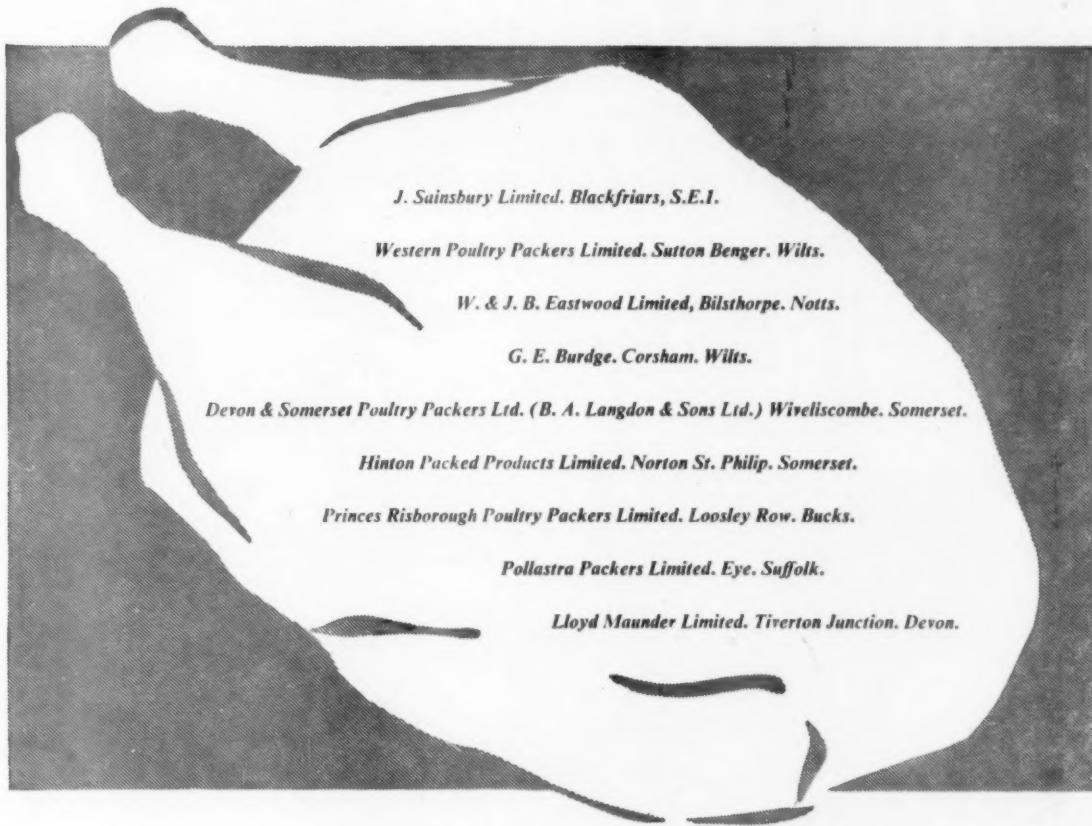
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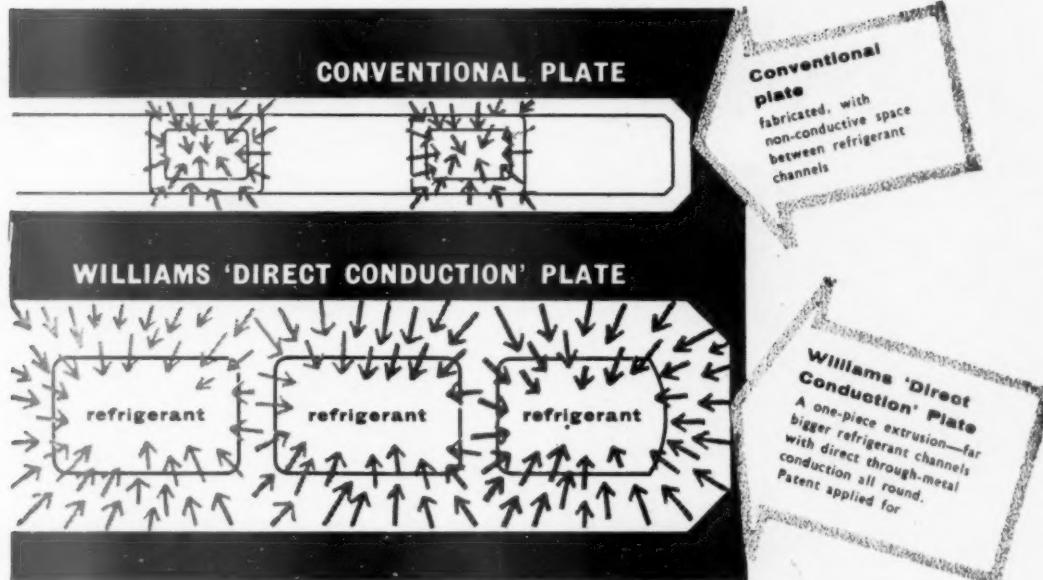
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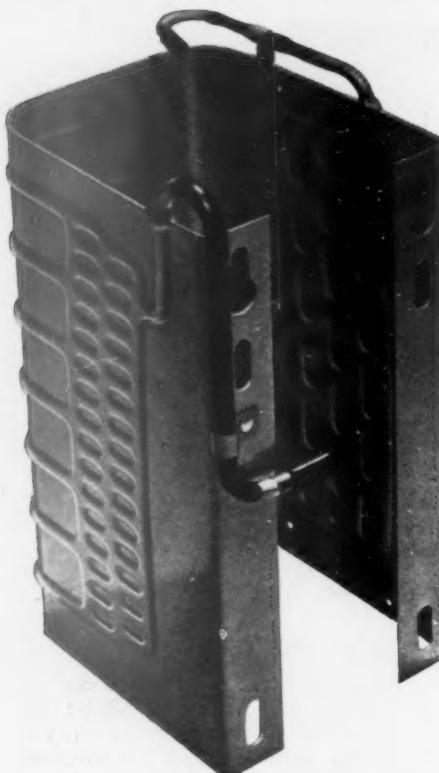
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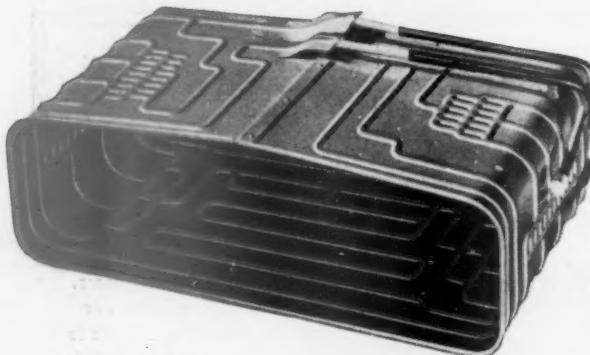
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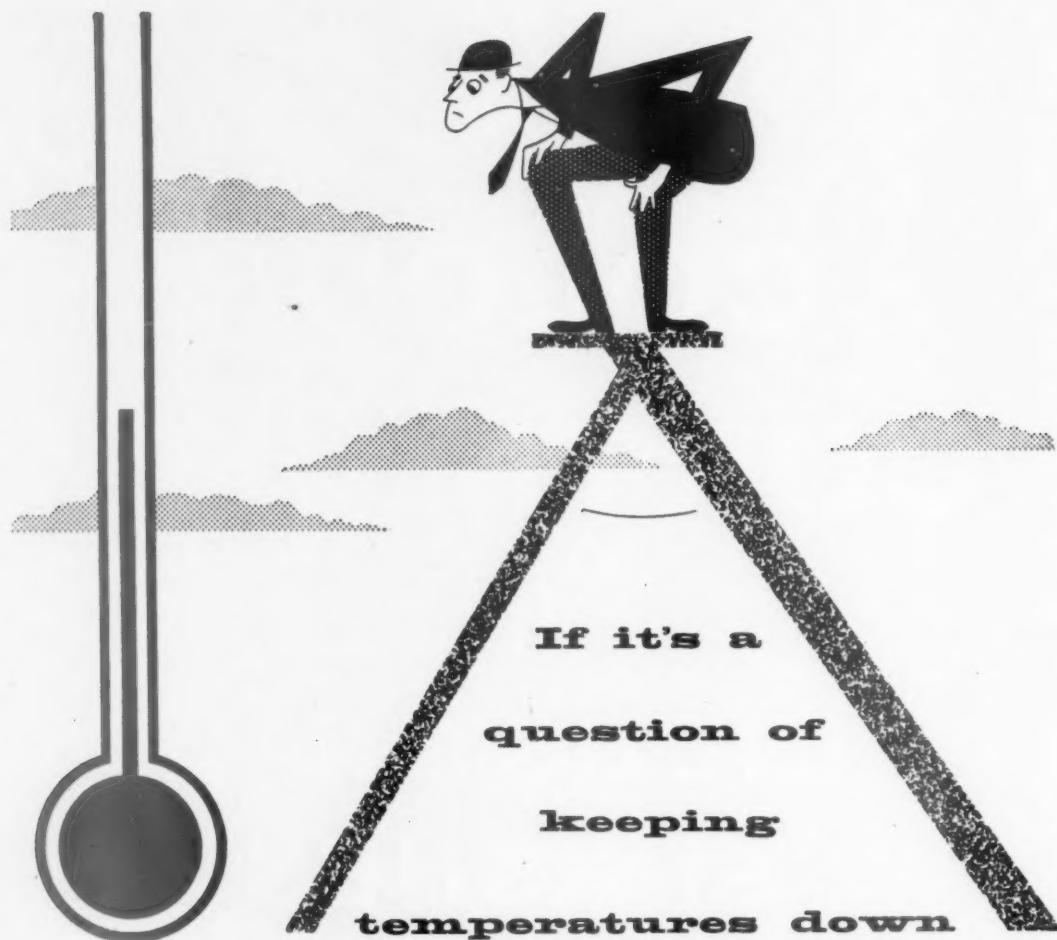
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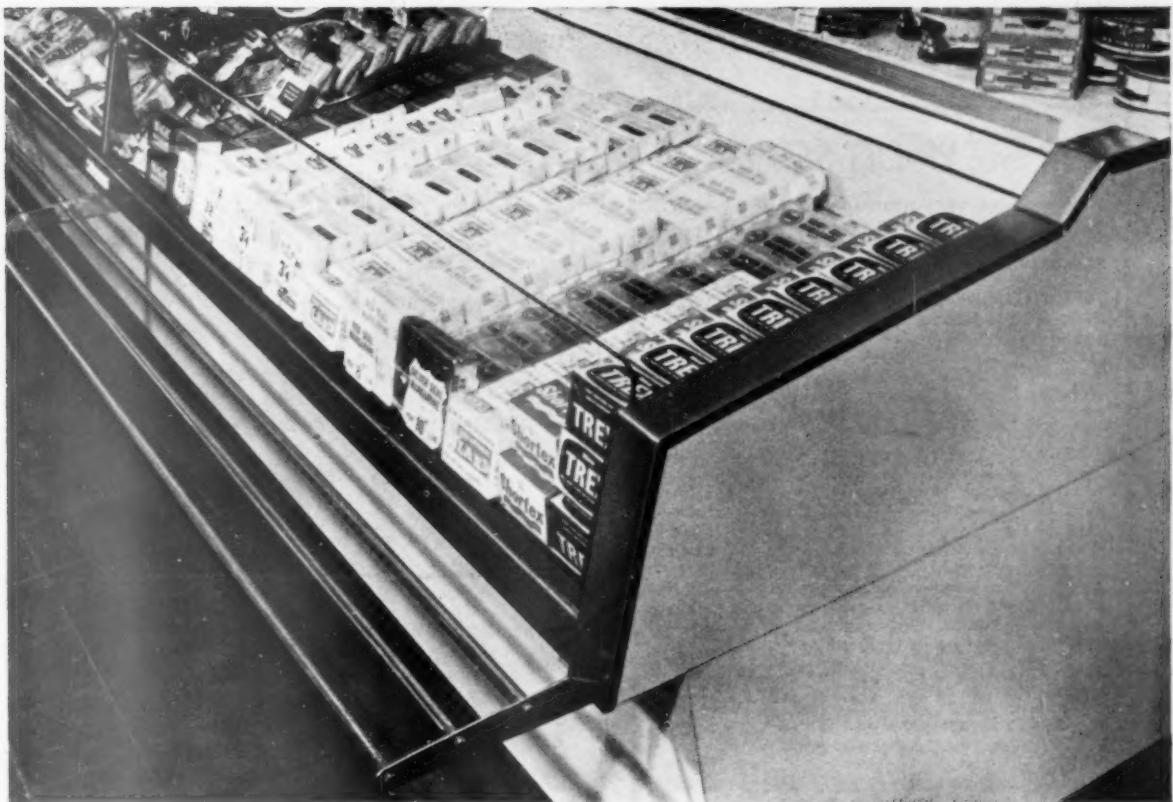
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'Darvic' cuts the cost of tailor-made Frozenaire display cabinets

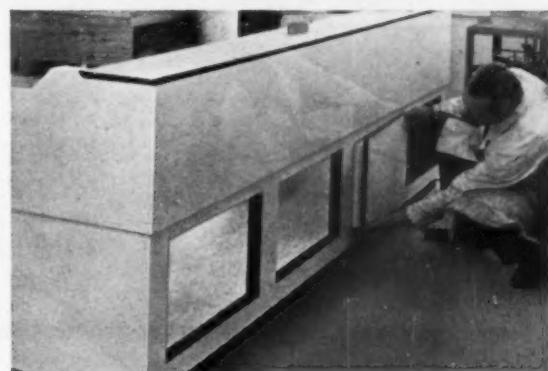
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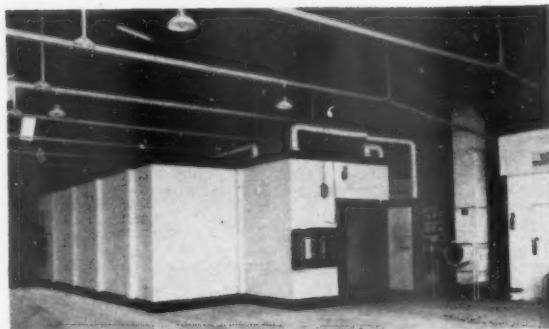
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Institute Dinner Great Success

The Household Industry

● The 61st annual banquet of The Institute of Refrigeration was an unqualified success. The change of venue to the very spacious Grosvenor House ballroom seemed to be the very thing that was needed, not only to accommodate the greatly increased numbers wishing to attend in recent years but to infuse a new atmosphere befitting a technical institution. It is no secret that some post-war dinners lacked something in the way of dignity, due mainly to overcrowding and consequent inattention to some very distinguished speakers. Last month's event was outstanding for the excellent hearing that the four good speakers received. The executive council, the sub-committee and the secretary are to be congratulated on a very fine evening—enjoyed, it would seem, by all the 750 persons present.

● According to the figures first issued by the Domestic Refrigeration Development Committee, deliveries of British-made domestic refrigerators to the home market during December totalled 34,254. This is 29 per cent. below December 1959 when the total was 48,265. The fall in demand for domestic refrigerators has, however, been slightly stemmed—November deliveries fell by 39 per cent. compared with November 1959. Total deliveries of British-made domestic refrigerators to the home market during 1960 were 929,362, compared with 849,362 in 1959. This increase of 9.4 per cent. is substantially lower than anticipated by the industry at the beginning of the year, and reflects the great harm caused by the re-imposition of severe hire purchase restrictions. Both 1958 and 1959 showed nearly a 100 per cent. rise in sales. Exports during 1960 were good. December deliveries to overseas markets were 10,453, an increase of 37.7 per cent. on December 1959—7,590. The total exports for 1960 were 136,574, an increase of 42.2 per cent. over 1959 when they totalled 95,998.

● To have France back again in the van of nations competing in the transatlantic luxury liner trade will revive many memories of *Normandie* and *Île de France*. The liner *France* soon to be commissioned for the New York run will be the longest vessel in the world. She will be the last word in modernity embodying more than a full share of original ideas and will, in every respect, be some 68,000 tons of beauty. Impressive in size and elegance, the beautiful lines of the almost entirely welded hull have already been the subject of much comment, and now all that remains to complete her profile is the addition of the funnels. Over the past few years, there have been many examples of a trend to introduce funnels of somewhat unconventional design and one knows there is the school of thought which favours

the funnel-less ship. Two basic thoughts decided on the type of funnels for the *France*: first and foremost there was the need to provide an efficient method of smoke and soot evacuation to avoid the soiling of decks and consequent discomfort to passengers. Secondly the funnels had to be so designed as to blend in with, and not interfere with, the fine lines of the ship. The conclusions are most interesting: *France* will have two funnels, whose streamline design will enhance the lines of the ship and contribute much to a very pleasing overall exterior view. In addition, the funnels will have marked originality: for the smoke will not leave from the tops of the funnels, but be diverted through large funnel "wings" to escape from the ends of these wings. *France* will, of course, be air-conditioned.

● Meeting a good response from industry is the *Daily Sketch's* "big brother" scheme to aid the export drive. Small manufacturers with limited resources are to receive support from many of the leading manufacturers and exporters in this country. Among the firms in our industry who have accepted the *Sketch's* invitation to help smaller firms selling a complementary but non-competitive line are Electrolux Ltd., General Electric Co. Ltd., English Electric Ltd., and Marco Refrigerators Ltd.

● As a "by product" of a series of basic research recently carried out at the U.S. National Bureau of Standards on free radicals, for the U.S. Department of the Army, a new method has been created to determine the optical properties of thin films of gases condensed on metal surfaces at low temperatures. In the procedure, devised by Jerome Kruger and William Amba, research scientists of the bureau's metallurgy laboratories, the refractive index of a substance is found by comparing data derived experimentally with data processed by an automatic computer. Results of the study are being used to determine the optical properties of thin films of other substances. In the ellipsometer employed to study reactions on metal surfaces, a beam of polarized light is reflected from the surface in such a way that the ellipticity and orientation of the beam are altered after reflection. These properties are related both to the thickness of any film on the surface and to the film's refractive index. However, the relationship is expressed in the polar form of complex numbers and is so complicated that the refractive index of the film cannot be readily calculated. A technique was therefore devised in which readings are taken with the ellipsometer at several unknown thicknesses, and from these data a curve is plotted of the change in ellipticity versus the change in orientation after reflection. Various values of refractive index and film thickness are then assumed, and the corresponding instrument readings are computed by the bureau's high-speed electronic computer. From the resulting data automatically processed, several curves are plotted and compared with the experimental curve previously derived. The correct refractive index for a particular film is found when a theoretical curve matches the experimental curve.

Despite the depression which has been buffeting the appliance industries, Mr. E. G. Rowledge, senior director of Prestcold, the chairman of DoRDeC, was optimistic last month when he addressed an informal luncheon given by the Domestic Refrigeration Committee for editors of technical and trade journals concerned with domestic refrigeration. After welcoming his guests on behalf of the firm, he said that the technical quality, appearance, features and price of refrigerators were "first class and couldn't be beaten." The demand for refrigerators was going up and he foresaw no major changes in the next twelve months. Mr. Rowledge denied that there were half a million refrigerators in stock

as some papers had reported. He said that the figure which the press was "bandying around" was "grossly overstated." But it was "ridiculous," he went on to say (as the Minister of the Board of Trade had said) that the export market should come first. "If we are to succeed in meeting competition from abroad" he added, "we must have the ability to develop the home market." One point in particular was stressed. A close relationship between the wholesale distributors and retailers to the public is essential. "At the moment," concluded Mr. Rowledge, "we are producing blindly, and this is most unsatisfactory."

Electrolux Demonstrate Thermo-electric Refrigerator

A SMALL thermo-electric refrigerator was demonstrated at a meeting of the Swedish Society of Refrigerating Engineers held recently in the Stockholm factory of AB Electrolux which has been working on the development of thermo-electric cold generation for several years.

A limited number of small box coolers with an internal volume of about 0.7 c.ft. have already been made in collaboration with research engineers of The General Electric Co. Ltd. in the Electrolux Central Laboratories, Stockholm.

Box coolers of the type now being developed by the two companies are intended mainly for picnics and camping and for use in cars and boats. They can be powered directly by a motor car battery and

consume 25 to 30 W. The temperature in the box is 35 to 55° F. below the ambient temperature. The cold generator is made up of about 100 thermo-electric elements pieced together in thin blocks no larger than a match box. The unit is light, silent and compact and has no moving parts. Its life is considered to be practically unlimited.

The thermo-electric elements that can be produced at the moment are not yet efficient enough for domestic refrigeration but will be found useful for certain special purposes. Results of the development work now being undertaken indicate that the manufacture of thermo-electrically operated domestic refrigerators might become an economic proposition in the not too distant future.

"DOMESTIC" OUTLOOK FOR 1961

"I AM confident that sales of domestic refrigerators this year will exceed those of 1960" said Mr. M. Horris, marketing manager, domestic refrigeration products, Prestcold, last month.

"Despite the difficulties of the present situation, the percentage of housewives owning a refrigerator is still relatively low, and the potential of market remains a very big one. With the new and better models at lower prices now available, backed by bigger than ever advertising appropriations, more and more people will come to regard a refrigerator as an absolute necessity. I am confident that more will be sold in 1961 than in 1960."

"Although 1960 sales did not realize expectations, nevertheless, they have more than equalled 1959 record figures, and it would be a mistake not to take an optimistic view of the forward situation. One hopes too that credit restrictions will be eased before long, and that we shall enjoy a better Summer than last year. Whilst it is true that both of these are imponderables, they are factors that could have a great effect on sales, and should be taken reasonably into account."

"I urge the trade to take full advantage of manufacturers' 'sale or return' schemes and other facilities, to stock the new season's models and to cover anticipated requirements by forward orders. No matter how good manufacturers' stock positions may be, there are bound to be delivery delays and loss of sales if the usual seasonal

stocking and ordering is deferred until demand actually arises.

"I would urge everybody to wholeheartedly and enthusiastically promote the sale of domestic refrigerators to ensure getting their full share of this business in 1961."

STEELE EXAMINATION

HEAD WRIGHTSON (Teesdale) Ltd., have placed an order with Pantak Ltd., of Vale Road, Windsor, Berks, for a 18 MeV Siemens Betatron. This mobile particle accelerator, the most sensitive X-ray unit currently planned for use by U.K. industry, can be used for examining steel thicknesses of up to 16 in. and reflects the growing trend towards welded fabrications in plate of increasing thickness and of denser metals. This trend is particularly pronounced in the fabrication of pressure vessels for the nuclear power and refrigeration industries.

The unit will operate in the heavy fabrications shop at Thornaby-on-Tees and will require less radiation safeguards than those which must be adopted for other particle accelerators and high power sources. Amongst the first applications of the Betatron are expected to be those of weld examination on the 4 in. thick walled steam raising units or heat exchangers for the Dungeness Nuclear Power Station, now under construction by the T.N.P.G. Consortium.

NEWS OF THE MONTH

Refrigeration and A-c Exports.—During December, 1960, air-conditioning and refrigerating machinery (commercial and industrial sizes) to the value of £817,563 weighing 1,269 tons, was exported from the United Kingdom. Comparable figures for December, 1959 were 1,369 tons, worth £833,405.

* * *

Exports' Analysis.—Of the 1,269 tons of air-conditioning and refrigerating plant worth £817,563, exported by Great Britain in December—quoted in the preceding paragraph—66 tons went to the Union of South Africa, 20 tons to India, 53 tons to Australia, 32 tons to New Zealand, 36 tons to Canada, 222 tons to "other Commonwealth countries," 28 tons to Eire, 25 tons to Sweden, 388 tons to Western Germany, 50 tons to the Netherlands, 23 tons to Belgium, 45 tons to France, 20 tons to Italy, and 261 tons to "other foreign countries."

* * *

Refrigeration Plant Classified.—Of the total exports of air-conditioning and refrigerating machinery during December, commercial refrigerating machinery accounted for 272 tons, worth £140,051, industrial plant and equipment for 279 tons worth £134,217, and refrigerating machinery, equipment and parts for 512 tons, worth £354,009.

* * *

Exports of Small Refrigerators.—During December, 1,225 tons of complete refrigerators and domestic refrigeration equipment were sent overseas from Great Britain. These exports were worth £752,318. The 1,225 tons comprised 39 tons to the Union of South Africa, 4 tons to Rhodesia and Nyasaland, 3 tons to India, 14 tons to New Zealand, 543 tons to "other Commonwealth countries and Eire," 30 tons to Sweden, 189 tons to Western Germany, 21 tons to the Netherlands, 2 tons to Belgium, 7 tons to Italy, and 373 tons to "other foreign countries."

* * *

World's Largest Meter.—The world's largest moving coil meter—17 ft. sq.—will overlook the Tenth Electrical Engineers Exhibition, to be held from March 21 to 25, at

Earls Court. The meter scale will be more than 20 ft. long. It will show the total electrical load connected during the exhibition. Mounted on the first floor by the Warwick Road entrance, the total weight of the instrument movement will be over 3 cwt. of which about one-tenth will be magnet. This will drive a 5 ft. long aluminium pointer whose indications on the scale will be easily readable from more than 100 yards. The instrument will register in the region of 4 M.W. The scale will be calibrated 0-5 M.W. The movement and dial have been designed and constructed by Nalder Bros. & Thompson Ltd., and a special current transformer will be coupled to the main intake to Earls Court from the London Electricity Board's supply.

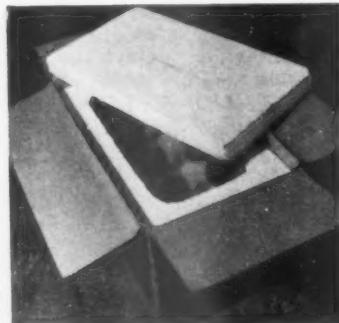
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U.K.'s Biggest Trawler.—Britain's biggest fishing vessel, the Associated Fisheries' 1,400 tons refrigerator trawler, *Lord Nelson*, was launched last month from the builder's yard in Bremerhaven, Germany. The ship has cost £400,000. A spokesman of the company states: "It is a revolutionary new ship incorporating many new features. It is the first distant-water trawler specifically designed to freeze half of her catch while at sea, and the first distant-water stern fisher. Its catches will arrive from as far away as the Arctic Sea as fresh as when caught—a factor of tremendous interest to the fishmonger, the catering trade, and most important of all, the housewife." The launch was attended by one of the men who pioneered the idea of distant-water freezer-trawlers—Mr. Tom Boyd, of Hull, a director of Associated Fisheries and managing director of the Lord Line in Hull. The *Lord Nelson* is expected to be completed by mid-March.

* * *

Frozen Specimens From Mont Blanc.—A team from the Middlesex Hospital Medical School recently spent three weeks at an altitude of about 14,300 ft. at the Vallot Observatory on Mont Blanc, Europe's highest mountain. There were seven members of the team, including three women, and the

aim of the expedition was to carry out physiological tests at high altitude, the members of the team acting as their own "Guinea pigs." During the time the expedition was at high altitude, physiological specimens were taken every 24 hours, frozen on the mountain and flown back to London for deep-freeze storage to await examination when the expedition returned. As it was essential that the specimens arrived in the frozen state special packages were made for the specimen bottles. These were boxes incorporating a



The polyethylene specimen bottles on arrival at Middlesex Hospital, showing the specially made "Styrocell" insulating pack.

2-in. lining of Shell Chemical Company's "Styrocell" expanded polystyrene, which due to its excellent insulating properties proved to be the ideal material for this purpose. All the specimens dispatched from Mont Blanc were still frozen when they arrived at the hospital.

* * *

Employee Comfort.—Lec Refrigeration Ltd. have embarked on a progressive scheme to give their employees every comfort by the large-scale installation of modern vending machines at the company's works at Bognor Regis, Sussex. Cold drink machines, cigarette machines, milk machines, coffee machines—in fact, the employees at Lec now have just about every type except a "fruit" machine. The management, realizing that it was impossible to allow employees to do their own individual shopping during working hours, decided to

ensure refreshment was available to those in need of it. The first machine was installed about a year ago as an experiment and received such wide acclaim from workers that others quickly followed. The latest gadget at the factory is a cold milk vending machine which has been nicknamed " Jersey Cocktail " and judging by the speed it is emptied it is a widely held view that the local cows are working overtime. Another ultra-modern machine is a coffee dispenser which serves coffee black or white with the required sugar and which works overtime for both employees and executives.

* * *

& Exhibitions Ltd., Grand Buildings, Trafalgar Square, London, and will cover industrial dairy plant and machinery and ancillary equipment. The Association is confident that this exhibition will have great appeal to dairy engineers in this country and throughout the world.

Australian Freezer-Trawler.—*Southern Endeavour*, a former Hull vessel, is to be converted into a freezer-trawler. Formerly the *Princess Elizabeth* owned by the St. Andrew's Steam Fishing Co. Ltd., she was bought 12 months ago by the Southern Trawling Co. Ltd., of Adelaide, Australia. The skipper, Sydney Duffield, a Hull man, commenting on the change said : "The fresh fish market is finished, anyway. It is being abandoned here and the future is in frozen fish." He is to buy the equipment in Britain and it is anticipated that the conversion of the trawler will take about six weeks. When completed, the freez-

ing of the fish will make the vessel independent of special fish quay facilities and she will be able to land at any port.

* * *

Transfer-at-Sea Trial.—The *Ross Hunter* left Grimsby last month on charter from her owners, Ross Group, Ltd., to Chris. Salvesen and Co. Ltd., of Leith, and is proceeding to Newfoundland where it will operate with the factory trawler *Fairtry 11*. It will endeavour to supplement the *Fairtry's* own catch of fish. *Ross Hunter* is a distant-water vessel of 171 ft. in length and 550 gross tonnage. She carries an experienced crew of 20 under the command of Skipper E. Attridge, of Hull. It is anticipated that *Ross Hunter* will be at sea 80 to 90 days off Newfoundland, putting in to St. John's for occasional supplies of oil, ice, water, etc. New methods will be used in an effort to discover the easiest and most efficient system of transfer of fish at sea.

Picture of the Month

The ultra-modern showroom at Prestcold's giant new factory at Swansea, South Wales. Besides being an eye-catching exhibition centre for their entire domestic and commercial range of refrigerators, the showroom can also be utilised for meetings and conventions.



ARIEL



HOTEL

REFRIGERATION AND AIR-CONDITIONING FACILITIES IN LONDON'S NEWEST HOTELS

LONDON'S lack of modern hotel accommodation is gradually being remedied. Two new magnificent buildings recently opened are The Carlton Tower and The Ariel.

The originality in design of Britain's first circular hotel, the Ariel, opened last month by Mr. Peter Thorneycroft, can be traced throughout the building.

Everything from soap and sugar cube wrappers to bath mats; from menus to shoe polishers and staff uniforms, sets an example in house style.

The company owning the Ariel is associated with J. Lyons and Company Ltd., the design section of which, headed by Kathleen Darby, collaborated with the architects and decorators to devise a subtle but attractive colour scheme in which the hotel emblem could be reproduced on more than 50 varied items.

The hotel may be described as a half-way house for the world's air travellers and here there is an association of ideas, for above the fireplace of the Ariel's Circle Inn is commemorated a 19th century Englishman's dream of a steam-powered aircraft—and the first-ever plan for an international airline which grew from it.

In 1842-3, a Somerset engineer named W. S. Henson conceived and patented a flying machine called The Ariel or The Aerial Steam Carriage. It never flew—although a number of models were made—but this prophetic invention captured the imagination of the world. The Ariel was widely

publicized in journals all over Europe and artist's impressions of it in the air even appeared on silk handkerchiefs. An illuminated enlarged colour transparency of an original coloured litho showing the Ariel flying near London is set into the wall of the Circle Inn, and provides the link between the Victorian era and the present day.

The Ariel will accommodate 300 guests in 186 bedrooms—96 doubles, 51 singles, and 39 studio singles, all on the three upper floors.

Among key features of all bedrooms are:

- (1) Special double windows to keep out any sound of aircraft.
- (2) Air-conditioning control, the first of its kind in a British hotel, which enables guests to regulate the temperature.
- (3) Bathroom and shower, 17 in. television and radio, operated from the bedside, and two-tone coloured telephone.
- (4) Original paintings and drawing, or lithographs—abstract and realist—by internationally known British artists.

It is the first hotel in Britain in which all the bedrooms enjoy full air-conditioning, and it is also the first hotel in Britain in which air-conditioning formed an integral part of the design. The architects were Russel Diplock Associates with F. J. Wills & Son as consultants. The entire air-conditioning, heating, ventilating and auxiliary services were entrusted to Carrier Engineering Company Limited.

The Ariel restaurant, decorated with rosewood paneling, seats more than 100 guests. The main service counter is at one end of the restaurant so that guests can see the cooking. In one corner of the room is a quick service lunch counter, with nine seats.



All 186 bedrooms, double on the outside and single on the inside of the building, are served by a Carrier "Weathermaster" system. In this system, air is drawn from outside into a central plant, where it is carefully filtered to remove dust and airborne solids, humidified or dehumidified according to the season. The conditioned air is distributed at an even temperature and high velocity through a small diameter conduit system to individual "Weathermaster" induction units concealed above the false

ceilings over the bathroom spaces adjoining each bedroom. These units mix and distribute the conditioned primary air and recirculate room air, and provide local temperature adjustment. Each unit contains a high-efficiency coil supplied with either warm or chilled water, the capacity of which can be regulated by the guests by a manual control mounted flush with the bedroom wall adjacent to the bed. By this means, guests may adjust the temperature to their liking without unbalancing the air supply.



Entry to the open-plan reception area is through two pairs of power-operated doors which open automatically when a guest steps on a recessed mat. The area is dominated by a wide, semi-circular staircase leading to the first floor. Novel feature of the reception desk is an electronic letter rack which indicates automatically that mail or messages are waiting for a guest.

Conditioned primary air is discharged within the unit through special nozzles to induce the circulation of room air through the water coil. The mixture of



The public house: view of the bar showing the three-section bottle cooling shelves, each section individually controlled, incorporating $\frac{1}{2}$ h.p. Yorkometric water cooler condensing unit.

room air and primary air is directed through a grille blended with the interior decor. The units are supplied with primary conditioned air from a ring-main above the false ceiling of each bedroom floor corridor, connected to the main air-conditioning plant in the basement by a single vertical riser. Air is extracted from each bedroom suite via a grille in the bathroom ceiling.

The automatically controlled central "Weathermaster" plant is installed in the basement with connexions to the boiler and refrigeration plant, and receives fresh air from an intake in the centre court of the hotel, which together with the intake for the

Non-drip water cooler incorporating $\frac{1}{2}$ h.p. Yorkometric sealed unit installed in kitchen.



kitchen and restaurant air supply plant, forms part of the fountain treatment in the central court. The room conditions maintained are 75° F. D.B., with 50 per cent. relative humidity in summer, and 70° F. with 40 per cent. relative humidity in winter.

The extract from each bedroom suite is taken via the vent in the bathroom ceiling to a ring-main with vertical riser connexions to three extract plants on the roof.

The extract fans and ducting are completely concealed in an annular plant chamber on the roof also containing water storage tanks and the hot water services ring-main headers and expansion tanks. The designers determined that the roof should be neat and the height was limited by the requirements of The Ministry of Aviation.

Other Services

The basement contains a considerable amount of equipment to ensure the comfort of the guests; besides the "Weathermaster" air-conditioning plant and the oil-fired boilers, there are calorifiers and pumping equipment for the supply to convector radiators and hot-water services throughout the building;



The kitchen cold counter, shelf and cupboard for butter, melon, salads, ice cream, etc., incorporate three separate $\frac{1}{5}$ h.p. Yorkometric condensing units.

together with the refrigeration equipment for the central air-conditioning plant and the secondary water supply to the "Weathermaster" units. Separate refrigeration is provided for the lounge bar cellar cooling plant and refrigerated food storage cabinets.

A novel feature is that the condensing water for this refrigeration is provided from a cooling pond forming part of the decorative scheme in the inner court, complete with fountains. The basement also contains the main plant for supplying filtered and tempered air to the lounge lobby, restaurant and kitchen. The extract systems for these areas are three-fold, clean air extract from the restaurant, clean air extract from the kitchen and greasy extract from the kitchen. These extracts rise to roof level for discharge.

The Ariel hotel has, in common with all Lyons hotels and "Corner Houses," been fitted out with refrigeration equipment supplied by York Shipley Limited. The installation incorporates twenty-two Yorkometric all-sealed units, and includes a York

model B.225 Icelet machine which produces up to 220 lb. of icelets in 24 hours, a salad and ice cream unit, non-drip water coolers, bottle cooling shelves, a draught beer cooler, and a number of cold stores and refrigerated cabinets.



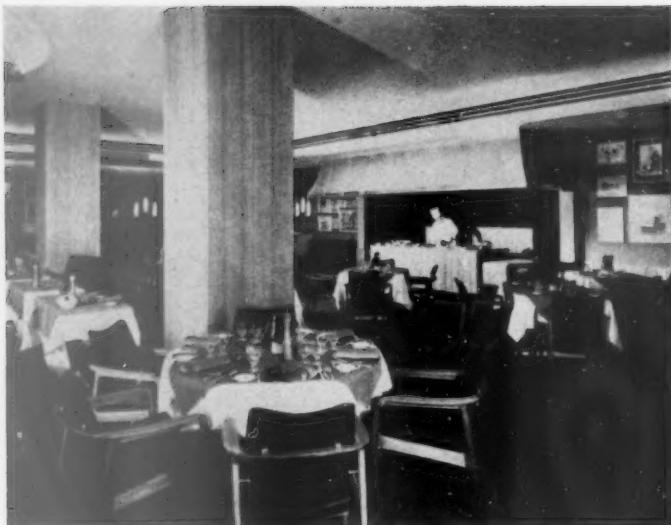
CARLTON TOWER

Refrigeration in London's Skyscraper Hotel

REFRIGERATION by Frigidaire Division of General Motors Ltd. has been installed in the new 18-storey Carlton Tower Hotel which was opened last month by the President of the Board of Trade, Mr. R. Maudling. On its dominating site in Cadogan Place, off Sloane Street, London, S.W.1, the Carlton Tower, at 208 ft. high, is the tallest residential building in London, and provides de luxe service throughout its 318 rooms, and its two magnificently appointed dining-rooms. Altogether a dozen items of Frigidaire equipment have been installed in the hotel by R. E. A. Bott (Wigmore Street) Ltd., Frigidaire distributors for Central London. First on view to the visitor is a special cooling cabinet in the bar which adjoins the fabulous Rib Room, the speciality restaurant where prime Angus beef is carved beneath a 16 ft. copper canopy.



The view from the tower suite of the Carlton Tower—208 ft. above London looking over the gardens to the Thames and south to the Surrey hills.



The Rib Room of the Carlton Tower, London's newest and tallest hotel, featuring fabulous prime beef carved beneath a 16 ft. copper canopy. Oak panelling, black leather banquettes, red carpet, red felt walls and pictures by Feliks Topolski highlight the room.

Here the Rib Room cocktail lounge, with its bar in English oak with black granite counter inserts, is fitted with an oak-clad wine and beer storage cabinet, where bottles are kept at a constant palatable temperature of 50° to 54° F. The cabinet is divided into two sections,

with wine racks adjacent to metal shelving for bottled beverages.

The Rib Room looks out through a wall of windows to the gardens of Cadogan Place, where one can stand, dwarfed by the enormous bulk which makes the Carlton



Fruit and vegetables are stored at 38°F. in this 570 c.ft. Frigidaire cold room, fitted with a wall-mounted forced-air cooler.



February 1961 MODERN REFRIGERATION



Frozen produce, including fish and poultry, is stored at a temperature of -5°F . in this Frigidaire cold room. The room has a total capacity of 730 c.ft. and is designed to receive an input of 3,000 lb. of frozen food daily. Cooling is by a Frigidaire forced-air cooler fitted with Frostmaster automatic electric defrosting.



A special Frigidaire cabinet in polished stainless steel clad in English oak keeps wine and bottled beverages at a cool 50°F . in the Rib Room cocktail lounge at the Carlton Tower. Wine racks are incorporated behind the first door, while in the other two sections are shelves for bottled beer and soft drinks.

B.E.P.C's 1961 Convention.—“Electricity in the prosperity and welfare of the nation” is to be the theme of the 13th British Electrical Power Convention which is to be held at Eastbourne from June 12 to 15, 1961, under the presidency of Sir John Pickles, B.Sc., M.I.E.E.



Tower a feature of the skyline from all parts of West London. From the top of the tower London's fastest hotel lifts descend at a speed of 500 ft. per minute, their final halt being the basement, where three large Frigidaire cold rooms store perishables for the hotel's kitchens. Largest of these is the meat cold room, from which the Rib Room will draw its beef. Of 780 c.ft. capacity, taking an average daily input of 2,400 lb. of meat, this room is cooled to 34°F . by a Frigidaire forced-air cooler fitted with Frostmaster automatic electric defrosting, and coupled to a $\frac{1}{2}$ -h.p. water-cooled condensing unit.

General produce is stored in a 570 c.ft. cold room cooled to 38°F . by a Frigidaire forced-air evaporator coupled to a $\frac{1}{2}$ -h.p. water-cooled condensing unit.

There is also a large store for frozen foods, of 730 c.ft. capacity and maintained at a temperature of -5°F . A Frigidaire forced-air cooler, also fitted with Frostmaster defrosting, provides this low temperature and is operated by a $1\frac{1}{2}$ -h.p. water-cooled condensing unit.

Smaller Frigidaire cold rooms, of 365 c.ft. and 410 c.ft. for meat and vegetables respectively, are installed in the main kitchen, which is reputed to be the most modern kitchen in England. Doors open automatically as the waiters approach them with trays of food cooked in ovens which revolve the meat as it is cooked to ensure even browning. Cold foods are not neglected and in each kitchen is at least one special “Jellywell” display and storage cabinet which holds jellies and other cold fare at 40° to 45°F . in the display section on top, and at 38° to 42°F . in the storage compartment.

Another “Jellywell” unit has been installed in the employees' cafeteria, together with a Frigidaire drinking water cooler.

Ireland, the Isle of Man and the Channel Islands. The convention sessions will be held at the Winter Garden and will open in the afternoon of Monday, June 12, when, following a civic welcome, Sir John Pickles will give his presidential address.



The realistic lagoon at Earls Court.

REFRIGERATION IN SMALL CRAFT

THE International Boat Show, organized by The Ship and Boatbuilders' National Federation and sponsored by the *Daily Express* and held last month at Earls Court, London, reflected the tremendous upsurge in the small craft industry and confirmed that the road-locked Briton has taken to the water as an escape from present-day claustrophobic motoring.

The small domestic refrigerator has now been accepted by many boat-builders and boat hirers as an essential piece of equipment in those craft with overnight accommodation.

Practically all the refrigerators being thus fitted are of the absorption type and, in the main, are operated by Calor gas. The Calor Gas (Distributing) Co. Ltd., have their own "acceptance panel" and, at the moment, their full approval has been given to Electrolux and Morphy-Richards. The models most favoured by boat-builders from the Electrolux range are the "L.27" and the "16."

Morphy-Richards "Astral" have introduced a new bottled-gas refrigerator—the A.200 C.—which is ideal for boat use. This compact 2 c.ft. table model refrigerator retails at £36 15s. 0d. Its dimensions are: height 25½ in., breadth 21½ in., width 21½ in. (including hinges)—and it has a shelf area of 4.2 sq. ft. Weighing only 75 lb., it will stand on a shelf or a table, or can be converted into a free-standing refrigerator with a set of contemporary-styled legs retailing at 29s. 6d. The new "Astral" A.200 C. table model refrigerator operates on bottled butane/propane at 10 in.-12 in. w.g. and has an

approximate consumption of 25 c.ft. (3/3½ lb.) of gas per week.

The Mini-Rex is another absorption type refrigerator which is being found in shipboard use.

Refrigerated Service on the Broads

ONE of the problems encountered by small-boat designers and operators has always been the provision of low temperature storage. The design of a unit which will operate efficiently and safely in confined spaces and in extremes of motion is costly and, consequently, few units suitable for this application exist.

In an attempt to find an efficient and economical answer to the problem, a well-known Norfolk Broads charter company, Blakes (Norfolk Broads Holidays) Ltd., which has boat yards spread throughout these waterways, approached Mann Egerton and Co. Ltd., Norwich, in the spring of last year. The result was the launching of a service which enables users of Blakes' boats (cabin cruisers with berths for four to eight people) to provide themselves with cooled storage space throughout their holidays.

Each boat carries a portable insulated container large enough to hold all perishable foodstuffs and provision is made for insertion into the container of

a sealed polythene bottle containing ice. Cooling is on the eutectic principle.

To provide the bottles of ice, each of Blakes' boat yards on the Broads has one, two or three freezer cabinets (depending on the density of traffic on that part of the water) each of which has a capacity of 49 ice bottles. These cabinets, which were designed and supplied by Mann Egerton are cooled with a 1 h.p. Sernette sealed condensing unit. Insulated with expanded polystyrene, they are of $6\frac{1}{2}$ c.ft. capacity and are designed to freeze their maximum content of ice bottles overnight. Approximately 50 such cabinets were in use on the Broads during the summer



Another scenic

last year and the scheme was found to be a complete success.

In practice, the boat user stocks up his insulated container with food and calls at a nearby Blakes' boat yard for a bottle of ice, which he takes from the cabinet. He places the bottle in the container and continues with his day's activities. The following morning, when the ice bottle is nearly thawed out, he calls at another boat yard elsewhere on the Broads, puts the thawed ice bottle back in a cabinet, and takes a newly frozen one.

Under normal conditions, a bottle of ice, used in the container provided, keeps food at 45° F. for 24 hours.

corner at Earls Court.

INTERNATIONAL INSTITUTE WORKING PARTY

A working party of the International Institute of Refrigeration met recently in Hamburg, under the presidency of M. Emilsson. Those attending included Messrs. Fidler, Kuprianoff, Hales and Merlin.

The main questions discussed were: The estimation of the maturity of bananas and of the colour of the pulp; the effects of wounds and of microbial infection on the maturation rate; the effects of the delay between cutting and loading on the quality of transport of bananas; metabolism of bananas; effects of ozone; cooking on banana cargo-ships; extension of the work of the group to fruits other than bananas.

First Air-conditioning System Using an Aircraft's Own Fuel Supply

HAMILTON Standard division of United Aircraft Corporation in the United States has recently developed the first air-conditioning system that uses an aircraft's own fuel supply for cooling. The novel type system has been put into operation on a specially modified Convair "B-58"

bomber, and cools the electronic guidance equipment of a Hughes Aircraft Company missile currently being flight-tested on the bomber. It also cools equipment for launching, tracking, and monitoring the missile.

The new air-conditioning system has its greatest potential on supersonic aircraft. At high speeds, planes such as 1,400-mile-an-hour "B-58" create so much friction and heat in their immediate atmosphere that liquid coolants rather than outside air alone, must be used to control the high temperatures generated inside the plane's electronic compartments. Conversion of a low-temperature fuel supply into a coolant accomplishes this control without adding extra weight to the aircraft.

The system has a capacity of 12 tons, enough to air-condition six five-room houses. It operates automatically over a range of temperatures from below zero to more than 200° F. Combined with the company's cabin air-conditioning and pressurizing equipment, used on all "B-58's," the system gives the modified bomber the greatest air-conditioning capacity ever built into an airplane, a total of 28 tons.

In operation, the new system pumps fuel from the aircraft's supply through a set of tubes in a heat exchanger, a device that works somewhat like a car radiator. At the same time, it also pumps a mixture of water and glycol into the exchanger through a second set of tubes. This mixture is chilled by the lower temperature fuel and is then piped to a

"Freon" vapour-cycle system which ultimately cools the electronic parts of the missile-carrying pod and the missile itself.

Because of an unusual arrangement of heat exchangers, the novel type system can operate over a wide range of temperature conditions without complex controls. Among other important features is its "Freon" compressor unit, the first of its type ever

developed for high-speed, pneumatic turbine power. Design of the compressor is based on Hamilton Standard units now in service on the Convair 880.

Supporting the new system are the company's ground carts used to test and check its operation. The carts, powered by electricity or a combustion engine, also take over cooling functions during ground-testing of the missile's electronic equipment.

U.S. Air-conditioning & Refrigeration Industry has grown, despite general economic softness

By GEO. S. JONES, Jr.*

A YEAR ago the air-conditioning industry reported that 1959 had been the "best year in its relatively short history," that it looked ahead to a 1960 which would break all records for the development, production, and use of the equipment which it produces.

To-day, after a year in which business activity generally has been reported as "spongy," our industry can look back on 1960 as a year in which it has not only held its own, but has shown concrete gains in most areas—and still looks ahead to the greatest decade in history.

First of all, it appears that sales of unitary air-conditioners, a category which includes all central residential equipment as well as some smaller commercial and industrial jobs, will be up at least 10 per cent. over 1959.†

Secondly, it seems as this is written, that large "systems" installations, such as those used in big office buildings, industrial plants, stores, and similar structures, will show a gain of at least 10 per cent. over 1959.

In the commercial and industrial refrigeration field, which shows less spectacular growth because of the fact that it has been longer established, commercial and industrial refrigeration has more than held its own in comparison with previous years. In this field, replacement equipment has become a big factor in the business, as users of older, obsolescent machinery find that it must be replaced by modernized equipment in order to compete.

Replacement of equipment also is growing to be a considerable factor in commercial air-conditioning, since many stores, shops, theatres, and other retail establishments put in air-conditioning prior to, or immediately after, World War II, and are finding it economically practicable to replace old equipment with newer, refined, modern equipment.

The biggest news of 1960 in the air-conditioning and refrigeration field, I believe, was the "breakthrough" we observed in the installation of central residential equipment by builders of new homes. To be sure, in previous years there has been a considerable volume of equipment installed in homes. But in 1960 the builders

of many medium- and low-cost development homes began including it as "standard equipment." In previous years air-conditioning had been standard equipment in higher-priced homes, and had been optional to the buyers of low- and medium-priced homes. Reports received from all sections of the country—north and south—indicate that buyers are demanding central residential air-conditioning; hence the noticeable trend.

One of the outstanding examples of low- and medium-priced homes complete with air-conditioning is the Belair development, between Washington and Baltimore. Here the builders of Levittown are planning construction of 4,500 homes—some of them priced under \$15,000—all of them equipped with central air-conditioning.

Of even greater importance—to the purchasers of these homes as well as to the industry—is the fact that the unitary air-conditioner certification programme, sponsored and directed by the A.R.I., has been impressed on dealers and contractors to the extent that virtually all unitary equipment now being installed in homes (all of it in the Levitt homes, incidentally) bears the A.R.I. seal of certification.

This seal, the symbol of A.R.I.'s programme of certification for unitary air-conditioning equipment, assures the purchaser that "certified" equipment has met certain drastic exhaustive tests, that it will not "break down" under adverse conditions, and that it will produce the cooling capacity claimed for it by its manufacturers.

The manufacturers of more than 90 per cent. of the U.S. output of unitary equipment, up to 135,000 B.t.u. hour in capacity, are participants in the programme. Early in 1960, the U.S. Air Force issued a directive requiring that all unitary equipment purchases for Air Force installations should bear the A.R.I. seal, and it is expected that other government agencies, recognizing the assurance provided by the programme may take similar action.

A number of other certification programmes are under consideration by A.R.I. product sections, and may be put into effect in 1961. These include such end-products as water coolers and heat pumps, and a number of components of both air-conditioning and refrigeration systems.

In the field of large central station systems, such as are used in hotels, apartments, office buildings, stores and

(continued on page 168)

*Managing Director, Air-Conditioning and Refrigeration Institute.

†A.R.I. does not represent the makers of room air-conditioning units nor of household refrigerators and freezers.

METHODS OF AIR-CONDITIONING MULTI-STORY BUILDINGS

In seeking new lines of advance in the design of contemporary dwellings and office buildings, modern architecture continually poses new problems in respect of interior layout and comfort requirements. The desire for more light and air leading in the extreme case to buildings consisting almost entirely of glass, raises difficulties in the disposal of unwanted radiant heat. Air-conditioning thus becomes more imperative as architecture progressively abandons the hitherto accepted traditions. Some of the aspects of this development are dealt with here.

THE considerations set forth below relate primarily to the heating and air-conditioning equipment of modern multi-storey office buildings. The architectural trends and building layouts of our day present comfort problems which are entirely new, and it is the business of the heating and air-conditioning engineer to find solutions to them.

If the modern office building needs more complicated and expensive technical equipment, it is not because our standards of comfort have risen, but rather because the comfort optimum was attainable with simpler means in buildings of the traditional type. The all-glass building lets in more light and so makes it possible to have rooms of greater depth; but it requires artificial cooling if it is to offer the same degree of comfort as an older building with much smaller window areas. Any company which erects such a building must therefore accept in advance the fact that installation and running costs for heating and air-conditioning will be higher than in a conventional structure; and any failure to realize this will inevitably lead to disappointments later on. The higher costs, however, may well be regained in the long run on account of the better performance of the staff and the reduction of absences due to illness. Increases of production of the order of 10 per cent. as a result of improved working conditions have repeatedly been confirmed by statistics.

As these considerations show,

*By courtesy of Sulzer Brothers Limited, Winterthur.

close study of the problem is essential if the correct technical conclusions are to be reached.

Comfort Requirements

The ideal air-conditions which the engineer must aim at are pleasant, temperate and independent of weather and outside temperatures. A certain rhythmical fluctuation of the conditions is, however, desirable, since this has a stimulating effect, unlike an absolutely constant internal "climate." The temperature may be a few degrees higher in summer than in winter, and for economic reasons the cooling capacity is not calculated on the basis of a few extremely hot summer days, but on a fairly frequent summer maximum. In the temperate zones an inside temperature of about 25 °C. will be chosen at an outside temperature of 30 °C., and this difference will be maintained if the outside temperature should rise higher. The relative humidity should lie between 45 and 60 per cent. Natural ventilation is not usually practicable, since noise, dust, exhaust gases and draughts combine to make the opening of windows undesirable. On the other hand, a sufficient supply of hygienically unexceptionable air must be provided.

In the modern office building with its large windows the heat of the sun puts the heaviest strain on the human organism, thereby reducing its working performance. The disposal of the heat gains due to solar radiation is also an expensive item.

Other requirements which the engineer must fulfil are the cooling and dehumidification of the air in rooms housing numerous occu-

pants and office machines, the removal of used and contaminated air, and the intense renewal of the air in conference rooms where many of the persons present may be smokers.

The demands made on the means of regulating the air conditions will differ in different cases. In large offices overall temperature control may suffice, in private offices individual control is often desired. The choice of the air-conditioning system will depend on this point, although it is often preferred for reasons of economy to control several private offices from one thermostat.

The supply of fresh air per person which is regarded as hygienically desirable is about 30 to 40 cubic metres per hour, or up to 50 cubic metres where heavy smokers are present.

Climatic and Technical Considerations

A multi-storey building usually overtops surrounding houses. It is therefore exposed to sunlight, the direction and intensity of which vary with the position of the sun, and which heats the surfaces of the building more or less according to orientation, angle of incidence, height above ground level and shading by other buildings. Between the time of maximum radiation and its effect on internal air-conditions, time lags of up to 12 hours may occur, according to the heat capacity of the outside walls. As the required cooling performance depends mainly on heat gains, the conditions must be calculated accurately in advance.

Table I shows window areas as a percentage of the whole façade, together with the percentages of the cooling requirements due to transmission through the building structure, occupants, lighting and window gains, for various types of buildings. It is clear from this table that the cooling requirements are chiefly dictated by the window areas. Building six appears to be an exception to this rule, but the discrepancy is explained by the fact that the principal windows here face north.

TABLE I
WINDOW AREA AS PERCENTAGE OF WHOLE FAÇADE
PERCENTAGE OF COOLING REQUIREMENTS DUE TO TRANSMISSION, OCCUPANTS,
LIGHTING AND WINDOW GAINS

Building	1	2	3	4	5	6
Percentage window area %	69	60	55	34.7	34.7	31
Air conditioned space m ³	14,200	13,000	9,100	25,000	10,000	6,800
Refrigeration output kcal/m ³ h	44	17	15	21	26	18
Percentage of this figure due to :						
1. Transmission %	10	15	14	6	6	12
2. Occupants, lighting %	10	20	18	8	8	51
3. Window heat gains %	80	65	68	86	86	37
Blinds or shutters	Int.	Int.	Ext.	Int.	Int.	Ext.

In buildings with large window areas it must be remembered that considerable increases in the internal temperature may be caused by sunlight even in spring and autumn, when outside temperatures are such that heating is still needed. These situations are often difficult to deal with, and must be allowed for both in the choice of air-conditioning system and in the selection of control zones. It may even happen that some zones require cooling while others still have to be heated.

The cooling plant is designed for a base load which permits sun gains to be disposed of as they occur, so that stationary conditions are maintained. As already mentioned, extremely hot days are excluded from the load diagram on grounds of economy. Consequently, if the blinds are not lowered when the sun first enters the room, the temperature will rise quickly and it will not be possible to get rid of the accumulated excess heat for some hours. The use of outside thermostats may help in switching the cooling system on in good time, but the attendants must still watch the weather and start the cooling system before sunlight falls on the façade if the heat stored in

the building structure, and particularly in the false ceilings, is to be disposed of quickly enough.

From the engineer's point of view, the blinds should be on the outside of the windows for it is only there that they can effectively reduce the heating of the window-panes and give up part of the radiant heat they absorb to the outside air. A special window design which can be turned on a vertical axis is of considerable interest in this connection, as it allows the blinds to be turned outside on sunny days and inside

in bad weather. Vertical radiation shields projecting from the façade also have their advantages, as they permit shading of the façade for part of the day at least. Metal shutter-type blinds turning on vertical axes have also proved valuable, as they are strong enough to stand up to winds, but unfortunately their heavy construction will inevitably restrict their use.

Comparative measurements were made with a Stoll-Hardy radiometer in two equally lighted rooms of a fully air-conditioned office building with Venetian blinds inside the windows. The blinds in one case were of light-coloured enamelled aluminium, in the other of highly polished aluminium. In the first case the equivalent radiant temperature of the blinds was 37 °C., in the second 27 °C. The reflective properties of blinds, even when these are placed inside the windows, consequently have a very pronounced influence on the comfort of the occupants of a room. The intensity of the thermal radiation of the blinds depends on their emissivity, and for the colours in commonest use, including light colours, this is 90 to 95 per cent., whereas for polished aluminium it is only 8 per cent. that of an ideal black body.

Even when the room temperature is lowered, the radiation from internal blinds is felt to be unpleasant, whether they are light or dark in colour, because the heat is first received and sensed by the body before being given up to the cooler room air. It is therefore important to cool the blinds with cold air, and this can be done with systems in which the air is blown in wholly or in part at the windows.

Great hopes of reducing summer cooling requirements were entertained in America when coloured glass was first used. The results fell far short of expectations, however, for although the direct entry of radiation was lessened, the glass was heated by absorption and thus itself gave off radiation in the infra-red range.

An improvement, however, is to be expected from the use of window glass vapour-coated with metals,



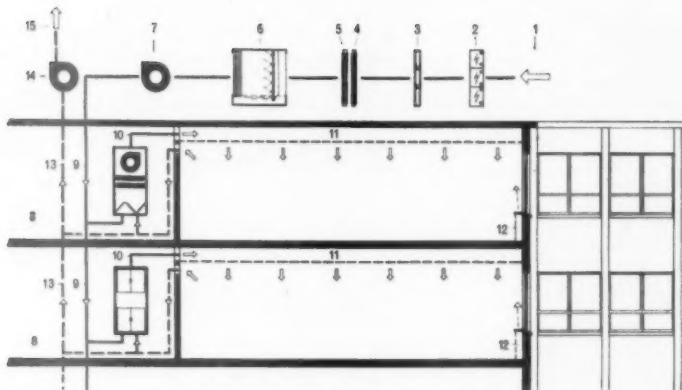


Fig. 2.—Diagram of a conventional air-conditioning installation with control zones for the various floors.

- | | | |
|------------------------------|--------------------|-----------------------|
| 1 Fresh-air intake | 6 Humidifier | 11 Perforated ceiling |
| 2 Electrostatic precipitator | 7 Fresh-air fan | 12 Window heating |
| 3 Cellular filter | 8 Floor substation | 13 Exhaust air |
| 4 Air heater | 9 Fresh air | 14 Exhaust-air fan |
| 5 Air cooler | 10 Supply air | 15 Exhaust-air outlet |

which has a high reflectivity for thermal radiation while impairing light transmission only very slightly.

All-metal window frames have also been a source of disappointment, since they carry cold to the inside when outside temperatures are low, thus occasioning condensation on the inner surfaces. Although the air-conditioning system would enable the relative humidity of the room air to be kept at the most desirable level, this trouble can only be relieved by accepting very dry air in winter. The provision of sufficient insulation in metal window frames, or the use of metal-clad wooden frames, enables the difficulty to be surmounted.

Large windows mean large heat losses in winter. Where very low temperatures occur, double glazing is a minimum requirement, permitting heat losses to be reduced by half. As the size of windows is increased, it is essential that window designs should be improved so as to cut down heat losses, as otherwise heating costs will rise unduly high.

Air-Conditioning Methods

There are various methods of carrying out the air-conditioning programmes based on the various requirements just enumerated. The choice will of course depend just as much on price and economy as on purely technical considerations.

In an office building having for the most part large rooms serving

similar purposes and with roughly the same numbers of occupants, such as drawing, designing or big commercial offices, it will usually be sufficient to limit temperature control to zones constituted according to aspect and embracing groups of floors, without providing individual control for single rooms. Separate treatment is then necessary only for conference rooms, special departments with automatic office machines, duplicating offices and the like.

Conventional System

The conventional air-conditioning system, which not only supplies the rooms with the necessary treated fresh air but also does most of the space heating by providing warm air, is very satisfactory for the requirements just described.

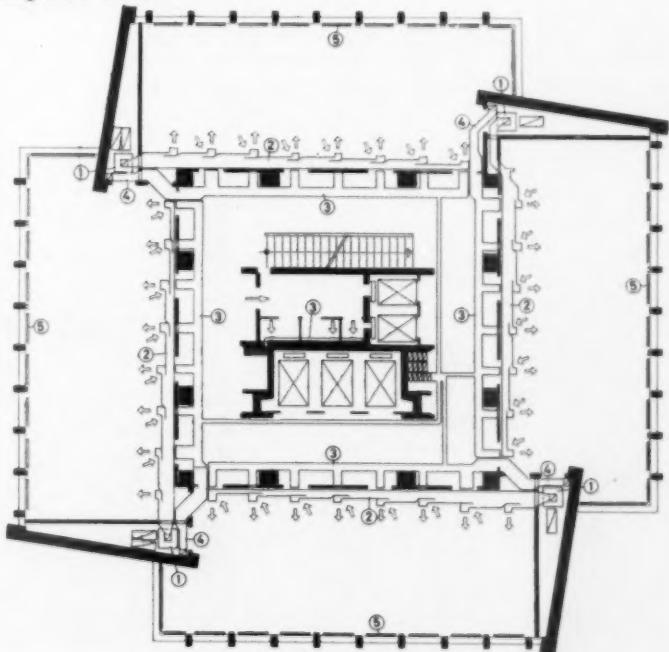
Figure 1 shows a tall administrative building. The specification stipulated that the rooms should be suitable for a wide range of uses, and for this reason the air-conditioning system was chosen to permit the four aspects on each floor to be controlled individually.

For the purposes of the air and heat supply, each window module or transverse section including one window, is treated as a unit, so that it is quite possible to insert or move room partitions at any time.

(continued on page 164)

Fig. 3.—Ground plan of the building shown in Fig. 1 with the four control zones.

- 1 Floor substations
- 2 Supply-air distribution
- 3 Return-air ducts
- 4 Distribution of recirculated and exhaust air
- 5 Heating under windows





FINE NEW PREMISES for NATIONAL COLLEGE

The new building, a stone's throw from the former Borough Road college.

THE National College for Heating, Ventilating, Refrigeration and Fan Engineering moved into its new premises at Borough Road, in 1960. All classes are now being held there, although the apparatus in the laboratories will probably not be available until Easter.

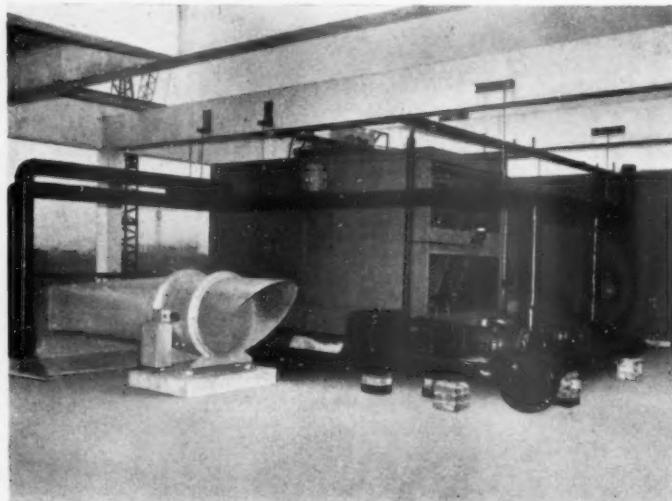
The college provides two main types of full-time courses in each of its departments. The diploma course in refrigerating engineering (which includes teaching in the application of refrigeration such as air-conditioning) is intended for apprentices in the refrigeration industry, and in industries which are large scale users of refrigeration. A one-year certificate course is also offered in air-conditioning and refrigeration which is especially designed for overseas students whose work lies in warm countries.

This course is more concerned with practice than the design of refrigeration material.

The laboratories are at present being equipped with two plants. A composite ammonia plant, for which all the big firms in the refrigeration industry have contributed through the B.R.A., has been brought over from the old building. As it stood before, it was capable of operating either single stage or two stage with any combination of various types of condensers and various types of evaporator. It has now been slightly modified. Brine, cooled by the ammonia plant is being used for cooling a Refrigerant-13 plant, the evaporator of which is arranged in a calorimeter to operate down to about -100° F.

The second plant will be a Refrigerant-12, single

Air-conditioning and ventilating plant installed on the roof.



Special "M.R." pictures.

or two stage, incorporating novel compressors, one being an Escher Wyss compressor. There will also be a calorimeter test unit for hermetic units, and a number of refrigeration firms have offered domestic cabinets.

Mr. R. W. Webb, the head of the refrigeration department, said that in twelve months he hoped there would be more expansion. He plans to include an absorption type, and a modern air cycle.

A representative selection of heating, ventilating and air-conditioning systems, suitable for modern buildings, has been fitted throughout the premises, which students will be able to observe and test under normal working conditions. All the laboratories on the lower levels of the building will be provided with mechanical ventilation employing ducts conveying air at conventional velocities, the inlet air being heated in winter.

An exhaust system for the rapid removal of fumes is to be provided for the refrigeration laboratory. The lecture theatre, the two upper floors of the building containing lecture rooms, library and students' study rooms, are to be air-conditioned. On the fourth floor the air-conditioning system will incorporate a dual duct distribution system, the ducts of which will convey air at high velocity. The classrooms on the third floor will be air-conditioned by means of diverse types of air handling units to which a supply of chilled water will be available. Self-contained air-conditioning units of various types will also be demonstrated.

The refrigeration and air-conditioning machinery required in connexion with the system for the third and fourth floor will be accommodated on the roof of the building, together with a water-cooling tower and evaporative type condenser which will serve the machinery at this level and for the lecture theatre.

COLD STORE APPOINTMENT

NORTHERN Cold Storage Limited announce the appointment of Mr. I. M. Rae as managing director of the company. Mr. Rae took up this appointment on January 1st.

In his capacity of transport and cold storage manager of Birds Eye Foods Limited, Mr. Rae was intimately concerned with the rapid development of that company. He played a large part in the establishment of a chain of distribution cold stores and large palletized stores. Also he has had many dealings with the public cold storage industry regarding housing of Birds Eye stocks.

In the field of transport, Mr. Rae has been associated with the development of rail transport for low temperature merchandise as witnessed by the A.F.P. containers introduced in 1958. He was also concerned with the development of large insulated and refrigerated road vehicles.

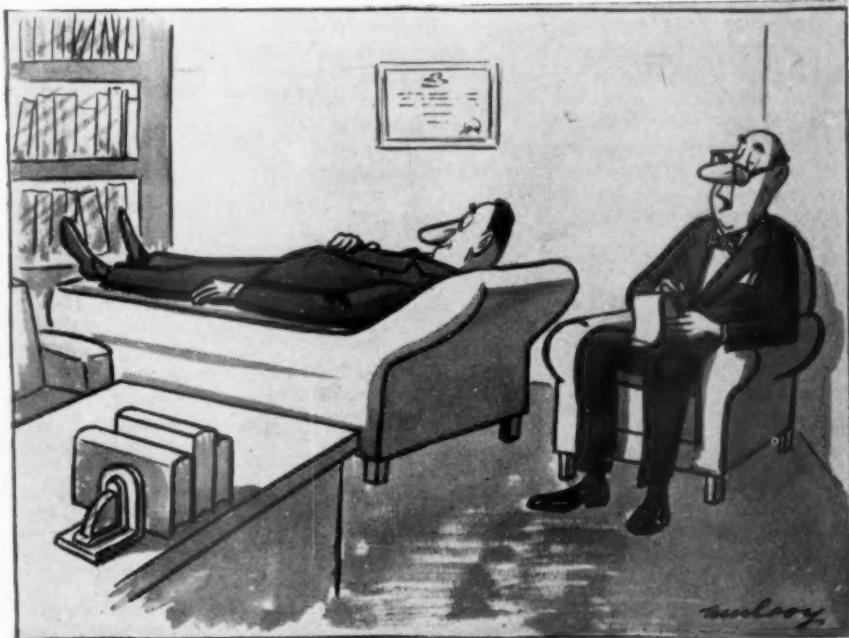
In order to take up his new appointment Mr. Rae resigned his position with Birds Eye Foods at the end of 1960.

Northern Cold Storage Limited has opened a small London Office at 11, New Fetter Lane, London, E.C.4, from which Mr. Rae has been operating since the turn of the year.

Refrigeration Follies—No. 2

"Now, tell me, when did you first realise you were the greatest refrigeration engineer the world has ever known?"

(*Members of the Entropy Club, please ignore.—Ed.*)



CHRYSLER INTERNATIONAL BRITISH PROGRAMME IN FULL SWING

CHRYSLER International increased its sale of Airtemp air-conditioning and heating equipment by more than 100 per cent. during 1960, Mr. Earl P. Lions, director of the company's special products office, announced from its Geneva headquarters last month. "This success," Mr. Lions said, "is gratifying, since 1960 was a difficult year for the air-conditioning business, due to the unsettled economic and political situation in many parts of the world, notably Latin America and Africa. We have countered this by extending technical and merchandising assistance to our distributors on a considerably larger scale."

"Our experience," Mr. Lions noted, "has proved that great opportunities exist in the air-conditioning field. In my opinion, the merchandising of air-conditioning equipment on international markets is still in its infancy."

The Chrysler International special products office, responsible for sales and marketing everywhere outside the United States and Canada, started operations less than two years ago. A regional headquarters covering the United Kingdom, the Far East and the Sterling Area, but excluding Australia, was set up in London last year. Its general manager, W. K. Bradley, said in London last month: "We have made tremendous progress in this country with our establishment and are progressively building up our distributor network, very adequate stocks of equipment and spares are in our warehouses to ensure both good deliveries and first class service and maintenance."

CORRESPONDENCE

To The Editor,
Modern Refrigeration
London, S.E.1.

Exhibitions

Sir,—We view with considerable alarm the position which is developing with regard to exhibitions for refrigeration plant and machinery in this country.

There is need for one major exhibition fully supported by all aspects and individuals in the trade, enabling it to develop into a truly International Fair which will attract exhibitors and customers alike to this country. The frequency of the exhibition is a matter for discussion as, whilst there may be a need for an annual exhibition for domestic and commercial equipment, there is possibly only need for a biennial show for machinery in the industrial field.

There are possibly more clichés and sayings on "united efforts" than on any other subject in the world but we appeal for thinking on these lines in the interests of a major effort on behalf of the industry.

Yours, etc.,

G. A. Henrotte,

G. Williams Engineering Co. Ltd.

January 6, 1961.

The Future of the Frozen Food Industry

Sir,—May I say that I was delighted to see that in his article in the Frozen Food Year Book published by Refrigeration Press Ltd., entitled "Glance at the frozen food industry's future" Mr. J. G. Sprott stressed the importance of increasing the size of the deep freeze space in domestic refrigerators.

It is clearly of very great importance to all suppliers and consumers of frozen foods that the quality, utility, and reputation of the products should not suffer from lack of proper storage accommodation in the home.

The two principal virtues of frozen foods are perhaps their frozen pristine freshness, and their capacity to save labour. Both suffer when domestic storage is inadequate as regards space and temperature. The peak of quality will not survive at chiller temperatures, and the labour of shopping for the day instead of, say, for the week or fortnight can greatly reduce the labour-saving attractions to a housewife in being able to buy her food ready for the oven or the pot.

It is, therefore, much to be hoped that the domestic refrigerator manufacturers will heed Mr. Sprott's advice, for it may well be no exaggeration to suggest that it could constitute one of the principal hinges on which the further development of the frozen food industry could turn.

Yours, etc.,
C. R. Havergal,
Chairman, Frozen Foods (London) Ltd.
126 New Kent Road,
London, S.E.1.

JAPANESE ASSOCIATION OF REFRIGERATION'S 35th ANNIVERSARY

The Japanese Association of Refrigeration, created in September 1925, celebrated its 35th anniversary at the end of November 1960. Since its foundation, the Association's activity in research and training in and popularization of refrigeration has never ceased. It publishes a monthly review, "Reito" (Refrigeration) and organizes lectures, improving courses, etc., in refrigeration.

The Japanese Association of Refrigeration is the correspondent of the I.I.R. in its country. The president is Mr. Ryoma Awaya.

ASSOCIATION OF EUROPEAN COLD STORES AND ICE-MAKING PLANTS

An Association of European Cold Stores and Ice-making Plants (A.E.E.F.) was constituted in Paris on October 19, 1960. Its main object will be to promote co-operation between cold stores and ice-making plants who are members of this association, either through the agency of national associations, or individually.

The president is Mr. M. A. Jakob (Switzerland). Countries so far interested are: Austria, Denmark, France, Germany, Ireland, Italy, Norway, the Netherlands and Switzerland.

Modern Refrigeration is obtainable from the manager, Maclaren House, 131, Great Suffolk Street, London, S.E.1, at thirty-five shillings per annum post free to any part of the world.



Night view of the glass-sided annexe block housing the two York Turbomaster packaged water cooling sets.

AIR-CONDITIONING FOR SOUND CONTROL

WITH the continued development of air transport and the resultant increase in noise created by faster and larger aircraft, airport authorities are giving more attention to the sound insulation of buildings erected near runways or testing bases.

The first airport building to be constructed expressly to meet sound proof requirements and incorporating a complete air-conditioning scheme is the recently completed Engineering Administrative Building of British European Airways at London Airport, where noise level within the offices has been reduced to 43 decibels. So effective is this noise control that a jet engine, which has a level of more than 90 decibels at a range of two miles, can be serviced close by the building without causing annoyance to the occupants.

The building is a simple structure of reinforced concrete, with precast fascia panels. The main contractors were Holland & Hannen and Cubitts, while the architects were Murray Ward & Partners. Scott & Wilson, Kirkpatrick & Partners were the

civil engineering consultants to whom Roger Preston & Partners were the consulting engineers responsible for all the mechanical

services associated with the contract. The main contractors for the heating and air-conditioning were Benham & Sons, with York Shipley Ltd.

B.E.A. Engineering Administrative Building with services annexe block at the side.



supplying all the refrigeration machinery. Barlow, Leslie & Coombes were the electrical consultants.

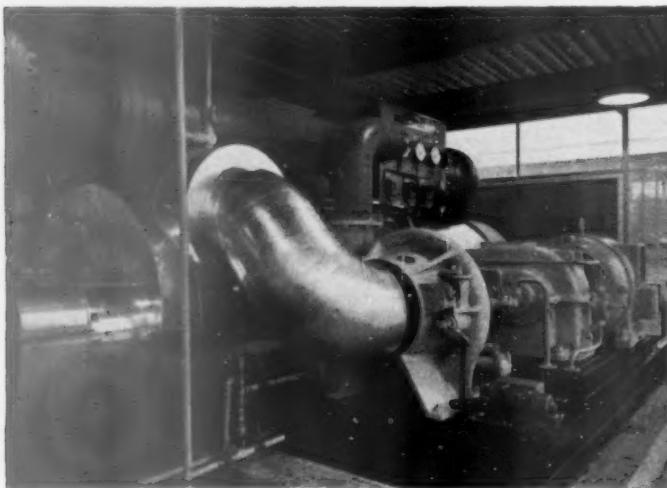
For the purpose of air-conditioning, the perimeter of the building is divided into four zones, each served by a separate high velocity double duct installation through air blending units positioned beneath the windows. These are arranged at each 6 ft. 2 in. module to allow complete flexibility of office partitioning. Hand controls are fitted to permit individual setting within certain

services annexe block apart from the main building. Cooling water for the condensers is supplied through two cooling towers built in the roof of the main building.

Hot water is supplied at high pressure from a Ministry of Transport and Civil Aviation central boiler house in which are installed two 55,000,000 B.t.u. and two 25,000,000 B.t.u. oil-fired La Mont boilers serving this and other buildings. It is piped at 350° F. through an underground external duct system to a calorifier on the ground

core of the building has separate cooling and heating equipment. Lavatories are also dealt with separately through a heater supply fan and duplicated extract fans.

New Financing Scheme.—A new method of financing major items of industrial equipment over periods related to their useful working life is announced in a new booklet, "Machine Life Finance," issued by Engineering Finance Ltd. The new method makes use of a long-term hire purchase agreement—the equip-



One of the two Turbomaster packaged water cooling sets supplied and installed by York Shipley Ltd.

limits. A common extract system is installed in the false ceiling.

The core of the building has its own low velocity system with ceiling diffusers. The conference room, situated on the fifth floor in the core, is provided with heater and cooler booster batteries to cope with occupational factors with wide extremes. Supply to, and extract from, the core is through high and low level grilles fitted adjacent to columns.

Chilled water, piped to cooler batteries at each of the installations on the sixth floor, is provided by two Refrigerant 11 York Turbomaster packaged water cooling sets by York Shipley Ltd. Each set comprises a York Turbomaster compressor driven through an increasing gearbox by a 200 h.p. Crompton Parkinson motor, shell and tube 38 in. diameter evaporator and 22 in. diameter shell and tube condenser with I.C.I. Integron tubes. This plant is housed, together with pumping equipment and Watford control panel, in a glass sided

floor where it is controlled fed into the system, which is maintained at 175° F., through a Spirax Sarco three-way valve.

Each of the four high velocity installations comprise an intake chamber, a filter room, fan suction chamber and filtered air supply chamber. Fresh air is drawn in through an adjustable grille in the external wall of the intake chamber and mixed with a proportion of recirculated air admitted through a similar grille linking the chamber with the exhaust duct, and passed, first through a Ventex oil filter and then a Vokes dry fabric filter to the common supply chamber.

The heater and cooler batteries are located separately at their respective sound resistant ducts in the chamber.

Air flow through the filter and into the service is provided by an Alldays & Onions multi-vane centrifugal fan. The extract and recirculation system comprises two fan sets and serves all air conditioned areas.

The low velocity system for the

ment itself being normally the only security—but the finance charges are calculated on the reducing balance outstanding at a per annum rate linked to Bank Rate.

MULTI-STORY BUILDINGS (continued from p.159)

The method of operation of this plant is illustrated in the drawing in figure 2. The central treatment station for fresh air, with an air intake about 6 m above ground level, is located in the second basement and comprises electrostatic precipitator, mechanical filter, pre-heater, washer, precooler and supply-air fan. Four rising ducts, one in each corner of the rectangular ground plan shown in figure 3, supply the air to the substations on the various floors. These consist of standardized supply-air units with filters, supplementary heaters and coolers, and fans; by mixing fresh air and return air from their own zone, they automatically regulate its atmospheric conditions.

TESTS WITH PLATE FREEZER

THE accompanying charts have been drawn by the Refrigeration Division of The Warrington Tube Company Limited in connexion with their plate freezers described in our November, 1960, issue.

The graphs were prepared from results of normal operating conditions when the freezer was operated under the supervision of the technical department of London Ice & Cold Storage Co. Ltd. The instrumentation used was an "Integra" Leeds & Northrop potentiometer, connected to a fixed recorder with a second portable checking unit employed.

At all stages of heat extraction the instruments showed that the plates were operating to within 2°F . of evaporating temperature. The thermocouple probes were inserted into various trays as near to the centre of the produce thickness as possible, and the results for top,

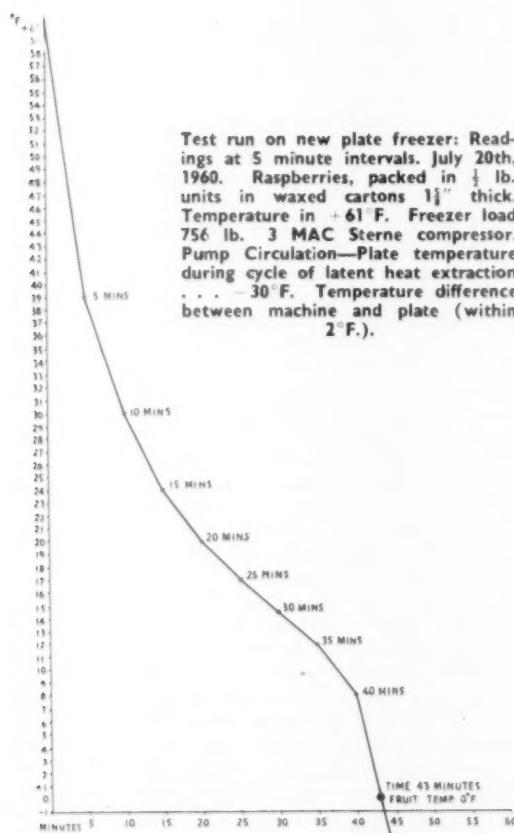
centre and bottom plates corresponded to within $1\frac{1}{2}^{\circ}\text{F}$.

In the case of tests carried out on fish, the trays were those which had been in common use over a long period and although their condition implied discrepancies in contact the overall results, as can be seen, represent a high degree of efficiency.

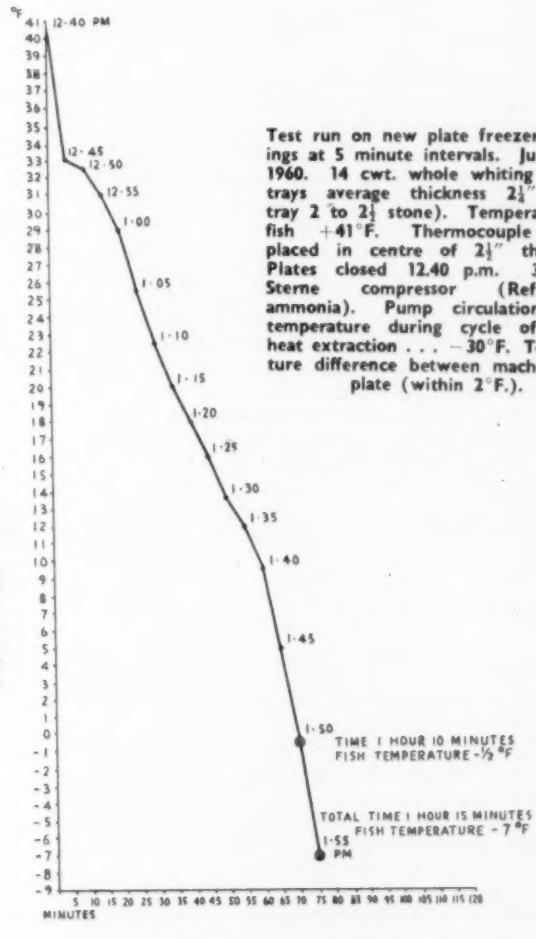
In the case of the raspberries, they were placed in waxed cartons on a shallow metal tray, spacers being

employed to ensure good contact without misshaping the pack. Again, thermocouples were placed in cartons on the top, centre and bottom plates, the variations between thermocouple recordings again being $1\frac{1}{2}^{\circ}\text{F}$.

Similar tests carried out over the past six months have shown similar and even improved results, we learn from Mr. Austin Jones, general manager.



Test run on new plate freezer: Readings at 5 minute intervals. July 20th, 1960. Raspberries, packed in $\frac{1}{2}$ lb. units in waxed cartons $1\frac{1}{2}$ " thick. Temperature in $+61^{\circ}\text{F}$. Freezer load 756 lb. 3 MAC Sterne compressor. Pump Circulation—Plate temperature during cycle of latent heat extraction $\dots -30^{\circ}\text{F}$. Temperature difference between machine and plate (within 2°F).



MASS PRODUCED AIR-CONDITIONING FOR UNITED KINGDOM

"BRITAIN has not been, until now, a market for mass produced air-conditioning, but the position has changed radically in recent months," according to W. E. Daniel, managing director of Fuel Efficiency Company Limited, of London, commenting on his company's appointment as a London and home counties

(continued on page 179)

PRESTCOLD'S NEW FACTORY

VAST SCALE OF SWANSEA BUILDINGS

JUST over two years ago, on a cold January morning, bulldozers and excavators began clearing a desolate part of the South Wales coastline near Swansea. From time immemorial the site had been the natural habitat of sea birds and a variety of other wild life. To-day, it is the home of Prestcold's mammoth new £5,000,000 refrigerator factory—one of the largest and most highly mechanized in Europe.

Perhaps the most amazing fact about the project, which must be rated as among the most ambitious the refrigeration industry has ever seen, is the speed with which it has been carried out. Incredible though it may seem, the first refrigerator left the production lines last March—exactly one year after the cornerstone was laid.

The story behind Prestcold's move to Swansea began at Cowley. Since 1934 the production of refrigerators was completed on a site adjacent to the vast car body manufacturing plant of the Pressed Steel Company Limited of which Prestcold forms a Division. The refrigerator systems were assembled and transported from a second factory which was brought into operation later at Theale, near Reading.

With the increasing home and foreign demand for both cars and refrigerators since the end of World War II came a problem. Faced with an acute shortage of available land at Cowley on which to expand their factory floor space, plus a labour shortage, it was decided to transfer the Prestcold Division to a completely new locality. Equally important was the economic necessity of centralizing the entire production of refrigerators under one roof.

Following representations made by the Board of Trade, the company was invited to locate the new factory on a fifty acre site at Swansea as it was felt that such a major project would encourage other diverse types of industry to a part of Wales which relied upon coal mining and steel making for its local economy. This opinion has since been proved correct and a number of well-known manufacturing plants are now following the example set by Prestcold.

The decision made, planning and building work proceeded swiftly. Within a few months a framework of steel weighing almost 3,000 tons began to take shape among the sand-dunes at Jersey Marine—situated equal distance between the Abbey Works of the Steel Company of Wales and the thriving Swansea Docks.

More than a thousand men were engaged on construction work and one of the first tasks to be completed was the sinking of hundreds of piles fifty feet into the hard-packed sand and, lower down, the coal layers running out beneath Swansea Bay. These formed the foundations to support the main structure and office buildings.

For those with a bent towards statistics, it may be interesting to note that into this frame went over 40,000 cubic yards of concrete to cover the floor space and roads; some two-and-a-half million bricks for the outside and partition walls; over one hundred and fifty miles of wiring to carry the power and lighting supplies and one hundred and twenty thousand square feet of glass for the roof windows. A special plant had to be set up at Llanelli to make the extra large expanse of steel mesh for reinforcing the concrete.

The new factory was built by Wales and Monmouthshire Industrial Estates at a cost of some £2,000,000 and, although it embodies the finest examples of modern functional architecture, one of the first things most visitors notice is the very great scale of the buildings.

For instance, the production block—which consists of nineteen bays sixty feet by four hundred and twenty feet—has nearly eleven acres under one roof. In simpler terms, this is bigger in area than five international soccer pitches, thirteen double lawn tennis courts, a croquet lawn and badminton court. The five feet wide rolled steel guttering, which carries rain water from the roof area, weighs fifty tons!

Attractive Surroundings

Since the factory is situated within such a short distance of an extremely attractive, but very sandy, coastline, it is hardly surprising that an important installation at the works has been the £242,000 heating and ventilation system. Dust and sand are prevented from entering the production block by the fact that all air ducts are covered with fine mesh filters. There are no opening windows. The heating in the factory is provided by thermostatically controlled downstream-type unit heaters which are so arranged that the heated air can be recirculated or balanced by a proportion of fresh air.

In summer, this heating system can be converted into a ventilating system by the adjustment of dampers. The latter are operated mechanically and, in the event of fire, would close automatically.

Although the plant is huge, at the same time it is close-knit and there is plenty of room on the site it occupies for future extension.

In principle, its layout is very simple. The office blocks, comprising of administration block; works office block; engineering block and the canteen block, are grouped in front of the production block, and act as a screen to the latter to form an attractive frontage of the factory as seen from the road. It should be added that this road is the main one linking Swansea with Cardiff. Many parts of it have undergone a major modernization scheme in recent years and, although considerable work has still to be completed, the Ministry of Transport forecast that

by 1963 this main highway will be one of the most modern and direct trunk routes in the country. From this it can be judged the importance of the site dominated by Prestcold.

The service buildings for the factory are at the rear of the production block and comprise a boiler house, compressor house, transformers, butane plant, trade waste treatment works and storage tanks, gas house, fire station and garage. These necessary structures of different shapes and sizes are hidden from public view by the main buildings and are united only by their common alignment on a service road.

Equipment throughout the factory cost in the region of £2,250,000 and, when fully operating, will provide Prestcold with the very latest manufacturing methods and techniques. These, of course, are essential in order to retain the company's leading position in the fast expanding and highly competitive industry of refrigeration.

Much of this equipment has now been installed and brought into operation but there is still a certain amount of work to be completed in various parts of the factory before the plant can be geared up into full volume production. At that stage it will have a capacity to produce up to several thousand refrigerators a week.

At present, engineers are engaged on the installation and testing of a new range of machines for the systems assembly section.

Though mainly purchased in Great Britain, some of these have been purchased from places as far apart as Germany and America and will, when fully commissioned, present one of the showpieces of the factory. This final stage of the factory project will coincide with the transference of work now being carried out by the Theale factory and is expected to be completed some time during the middle of this year.

Meanwhile, engineers from the firm of Fisher and Ludlow have brought into partial operation the impressive five-and-a-half miles of overhead conveyor system. This webs the roof of the factory linking the system, cabinet, paint, and final assembly departments in a giant overhead marshalling yard for refrigerators in all stages of construction. It has been likened to a complicated railway network of main lines, sidings and goods yards. Movements are co-ordinated from a central control room not unlike a modern signal box, but with a former helicopter pilot in charge. He is assisted by a production programmer and an engineer responsible for the efficient running of the conveyor.

Judging by the number of applications for employment received, there is evidently keen enthusiasm on the part of local workers for this new type of industry to their area. Jobs have been found for employees of all kinds: draughtsmen, chemists, office-staff, and many others. As suspected, however, one of the major tasks which confronted Prestcold at the outset was the recruitment of suitably trained operatives to bring the factory into first production.

Although there was an above-national average of unemployed in the area, most of the people concerned were untrained for the particular skills and

mass production techniques demanded by the refrigeration industry.

Training Centre

To overcome this problem, a part of the factory was turned into a training centre where all new operatives were taught the basic skills required for such work as welding, assembly, viewing, straightening, etc. Intake at the centre, and the period spent in training, was based on work schedules and, to give the courses a realistic basis, trainees were engaged on actual "factory floor" production work. In this way they became familiar with their new jobs by working on the actual products.

More than two hundred men and women were trained in this way to form a nucleus of production workers and, to their credit, they absorbed the varying skills in a remarkably short time, bearing out the claim that Welsh workers learn quickly.

The training officers at the factory are now working on an apprenticeship scheme embracing not only craft and student engineering apprentices, but graduate and special trainees as well. Progress with this scheme, which is intended as the forerunner of a far more comprehensive one, depends on production progress.

Prestcold recognizes the value of keeping its employees fully informed. An internal newspaper is published at regular intervals to provide employees with news from all parts of the Pressed Steel Company's group of factories. In addition, every new production worker is given an induction lecture comprising a very comprehensive list of subjects specially chosen to help him fit rapidly into the organization.

Something which never fails to impress most employees at the factory is the importance the company places upon their welfare. Facilities at the factory include an ultra-modern, one-thousand-seat, canteen and a superbly equipped medical centre which can be compared favourably with the finest in any industry throughout the world. The latter is staffed by the works' own medical officer and two qualified nurses and, among other things, has an X-ray and physiotherapy department.

Another advantage Prestcold offers to its employees is a very comprehensive pension scheme. All factory workers are entitled to a substantial free life insurance during their employment, and to free, non-contributory pensions on normal retirement after ten years' service. There are special benefits for widows or dependants of any employee dying shortly after retirement. The company pays the greater part of the cost of the staff pensions fund, but both factory workers and staff may, if they wish, make voluntary contributions to secure higher pensions or additional endowment assurances.

Even before the first factory brick was laid, the company and trade unions signed a sensible agreement setting out the broad principles governing wages and working conditions.

The company undertook to pay a level of earnings similar to those already operating in the locality and it was agreed that wage rates should be discussed

between the company, the Engineering and Allied Employers South Wales Association, and trade unions.

An important part of the agreement is quoted herewith: "The company subscribes to trade unionism and will at all times afford the proper facilities for the exercise of trade union functions. It is, however, opposed to the principle of the closed shop and reserves the right to employ workpeople irrespective of trade union membership."

It is an epoch-making document in industrial relations and has become known as the Gloucester Agreement, after the city where it was signed.

Payment is made to employees at the factory on a measured work basis. The method is regarded as the fairest way of providing a fair reward for fair effort, and was foreshadowed in the Gloucester Agreement.

In the same manner of forward planning, and in line with a policy of volume production, Prestcold are developing their marketing organization. During the next three years, they intend to acquire the businesses of their distributors in England and, in their

place create regional marketing units which will, within limits, be autonomous in their operation. A number of these businesses have already been purchased and negotiations are now being carried out for others.

These marketing units will operate under the control of a regional manager and his staff who will undertake responsibility for the selling of commercial and industrial refrigeration equipment, together with the distribution to the retail trade of domestic refrigerators and other appliances which will be manufactured by Prestcold. In addition, complete service facilities will be available in each region.

When this plan is completed, Prestcold will undoubtedly possess the finest marketing organization of any refrigerator manufacturer in Great Britain.

Such is the story up to date of Prestcold's move to South Wales. A mammoth new factory such as this has, without doubt, a great future ahead. Behind the project, Prestcold adds the benefits of more than a quarter of a century's experience of research, design, engineering and manufacture. Every scope therefore exists to maintain its pre-eminence in the world of refrigeration.

A.R.I. Programme

(continued from page 156)

other multi-room buildings, the industry feels safe in estimating that these installations will be up at least 10 per cent. in 1960 over 1959, when all the returns are in. Total "installed value" of such systems in 1959 was more than \$715,000,000, and it seems probable that the 1960 figure may well be in the neighbourhood of \$800,000,000.

These big systems, which gave most Americans their first taste of air-conditioning in the pre-World War II days, still account for the largest share of the industry's sales, and offer a very great potential in the industrial field, where only about 10 per cent. of all factories are now air-conditioned. We in the industry feel that the case histories of factories and offices whose efficiency indices have gone up sharply with the installation of air-conditioning are beginning to have a cumulative effect on non-air-conditioned establishments, and that 1961 and subsequent years of the 60s will see a snowballing in the percentage figure for air-conditioned work places.

These are only a few of the applications of the refrigeration cycle, not only in our everyday lives, but in many specialized fields.

Automotive air-conditioning is becoming a bigger factor each year, as the manufacturers of cars of all sizes produce an increasingly large number of models factory-equipped with air-conditioning and the size of the industry which manufactures units for so-called "field installation" continues to increase. While the automotive air-conditioner has not reached the widespread use that the automobile heater has achieved, its popularity is increasing, and the day may not be too far distant when 50 per cent.

of all automobiles may be equipped for comfort in summer as well as in winter. The Society of Automotive Engineers has estimated that by 1962 one in nine cars will be air-conditioned, and 25 per cent. of all cars produced within five years will be factory-equipped with air-conditioning.

In the field of commercial and industrial refrigeration, the longer-established phase of mechanical cooling, 1960 has been, as indicated above, a very good year for most of the many products covered in this broad category, and forecasts of increased marketing facilities for foods, more than three-fourths of which are cooled at some point along the route from producer to consumer, as well as building outlook and developments in scientific and defence applications, all point to a further step-up in utilization of the equipment which is necessary to the daily movement of the nation's food supply, medical and scientific welfare, and defence operations.

Military uses for specialized cooling equipment have shown great growth in the past few years, as highly intricate electronic processes, weapons systems, test facilities, supersonic aircraft, and nuclear-power applications have become an ever greater part of the nation's defence equipment. As these developments, and those which grow out of them, progress even further, the essentiality of mechanical refrigeration to their production and operation will become more apparent and vital.

I feel that our "forecast for the 60s," as expressed a year ago, gives every indication not only of "standing up" during the coming years, but of being proved unduly conservative, as far as the refrigeration and air-conditioning industry is concerned. Our manufacturers will not only keep up with the demand, they will continue to provide better and more efficient equipment, through research and development activities, aimed at even greater and more efficient contributions to our nation's health, comfort, productivity, happiness and defence.

Additional Electrolux Models for 1961

THREE attractive refrigerators in the lower price range have been marketed lately by Electrolux Ltd.—model L.40 at 59 guineas; the



The elegant new Electrolux L.40 refrigerator has 8 sq. ft. of shelf area, and a low temperature compartment which will hold as much as 7 lb. of frozen food.

De Luxe 26 (LA.26) at 47 guineas and the space-saving "Sixteen," at 31 guineas. With the introduction of the new model L.40, the Electrolux range of refrigerators is increased to seven models offering sizes—1½ to 7½ c.ft.

Price Reduction

The price of the Electrolux model L.26 refrigerator has been reduced from £47 17s. 5d. (including £7 11s. 2d. p.t.) to £45 3s. 0d. (including £7 2s. 7d. p.t.), and a limited number will continue to be available, in cream only, during the early part of 1961. Dealers holding stocks of this model are being reimbursed with the difference in price.

The L.40

Elegantly styled by Carl Otto—one of the world's top industrial designers—the Electrolux L.40 brings luxury refrigeration and the "luxury look" in refrigerators within reach of most people. Attractively appointed and finished, in either white or cream, with ice-blue and gold colour trim, the L.40 is robustly constructed with an all-steel shell, and the door-for-storage is fitted with a "feather-light" closing action.

With 8 sq. ft. of shelf area and 4 c.ft. capacity, the Electrolux L.40 is big enough for the majority of families yet small enough for most kitchens. Its low temperature compartment holds as much as 7 lb. of frozen food—most types of which it can keep safely for at least three weeks. Ice for drinks and cocktails can be made in the compartment in two ice-trays which provide

1 lb. 5 oz. of ice. Below the compartment is a cold tray for storing uncooked meat and fish. For keeping salad, vegetables and fruit crisp and fresh, the refrigerator has a full-width drawer which can easily be removed to a work table while food is being prepared. When not in use for vegetables the drawer is a convenient place for storing other foods.

The door of the L.40 is planned for easy storage and has two special compartments for butter and cheese. Three adjustable shelves accommodate bottles, small packets, tins and eggs—and milk and wine bottles can be stored on the lower shelf. All shelves can be removed quickly for cleaning and for parties the lower shelf can take five hock bottles if the next shelf is removed.

An optional extra for the L.40 is a specially designed TrayTop to provide an additional working surface in



The Electrolux De Luxe 26 has 5½ sq. ft. of shelf area, and a low temperature compartment for 3½ lb. of frozen foods—most types of which it will keep for up to three weeks.

kitchens where space is at a premium and a colourful tray for carrying food. Available with an edging in white or cream to match the cabinet, there is a choice of red, yellow or blue base colours in an attractive gay, new Donegall tweed pattern.

The Electrolux L.40 is available for operation by electricity or gas. It measures 36 in. high, 22½ in. wide and 24½ in. deep and weighs 125 lb.

Price: £61 19s. 0d. (including £9 15s. 8d. p.t.)

TrayTop as an optional extra—£2 0s. 0d.

De Luxe 26

The Electrolux De Luxe 26 is a completely new version of the popular model L.26. It has 5½ sq. ft. of shelf space, 2·6 c.ft. capacity and a fully enclosed low temperature storage compartment which accommodates up to

3½ lb. of most types of frozen food for up to three weeks. For ice making there are three trays—one with a quick release handle—to make 66 pieces of ice at just the right size for cocktails and cold drinks, with flexible dividers to enable individual pieces of ice to be removed.

Available in sparkling white or cream enamel with colour decoration in ice-blue and gold, the De Luxe 26 has an all-steel shell and a hygienic, easily cleaned food compartment in ice-blue. The top interior shelf will hold six standard size pint bottles of milk and is reversible to provide storage for taller bottles. It is equipped with a new type door catch with a "feather-light" closing action, and a chromium plated handle.

The "door to store more" has four shelves—one serves as an egg rack—all of which can be removed easily for cleaning.

As an optional extra—the Electrolux TrayTop with edging in white or cream, to match the cabinet and a choice of red or blue base.

The Electrolux De Luxe 26 is available for operation either by electricity or gas. It measures 31½ in. high, 20½ in. wide and 23½ in. deep and weighs 96 lb.

Price: £49 7s. 0d. (including £7 15s. 10d. p.t.)

TrayTop as an optional extra £2 0s. 0d.

The Space-saving "Sixteen"

Styled specially for smaller kitchens and smaller household budgets and first of the Electrolux 1961 range to be announced (October, 1960), the "Sixteen" can be put on a cabinet,



New from Electrolux, the space-saving "Sixteen" refrigerator at 31 guineas. An attractive stand for floor mounting is available for 2 guineas.

hung on a wall or mounted on a stand. It is compactly planned, with 3½ sq. ft. of shelf area and 1½ c.ft. capacity.

To Complete the Electrolux Range Model L.27. Prices: Bottled gas

(continued on page 184)

The Institute of Refrigeration Bulletin

Institute Headquarters: New Bridge Street House, New Bridge St., London, E.C.4 (CENtral 4694)

MARCH MEETING

The meeting of the Institute to be held at the Institute of Marine Engineers, The Memorial Building, 76 Mark Lane, London, E.C.3, on Thursday, March 2, 1961, will be a half-day meeting, commencing at 2.0 p.m., and will be a joint meeting with the Low Temperature Group of the Institute of Physics and the Physical Society.

The meeting will take the form of a symposium on "Problems of thermal insulation and their solution" and the speakers will include:—

Mr. G. Yate Pitts, M.ENG., on "The mechanics of frost-heave."

Mr. W. Molnar, B.A., on "Superinsulants."

Mr. M. J. Hickman, on "Thermal conductivity standards and low temperature insulation."

Professor G. G. Haselden, B.Sc., and Mr. G. Martin, B.Sc., on "Factors involved in the design and testing of large tanks for liquefied gases."

A discussion period will follow each paper and there will be an interval during which tea will be provided.

NATIONAL ENGINEERING LABORATORY

A conference on the condensation of superheated steam will be held on Tuesday and Wednesday, March 14 and 15, 1961, at the National Engineering Laboratory, East Kilbride. It will start at 11 a.m. on March 14, for the benefit of people travelling from England by air, and the formal sessions will end at lunch-time on March 15. Opportunities will be provided for those attending the conference to visit the heat and other laboratories at NEL during the afternoon of March 15.

For many years, engineers have argued about the effect of superheat on heat transfer from condensing steam. Some assert that superheat has a bad effect, and instal desuperheaters in process plant. But others are unable to understand how such an effect can arise. When steam is used at higher pressures for power generation, it is now common practice to heat the boiler feedwater with steam bled from the turbines. Such steam may be superheated enough to make it possible to heat the feedwater above the saturation temperature of the steam.

Although feedheaters are now being designed for such "negative terminal temperature difference" operation, many designers admit to feeling their way; authoritative design data are lacking.

The National Engineering Laboratory is working on the feedheater problem, and is considering extending this work into the process field. The conference at the laboratory will thus serve both to make clear the existing state of knowledge in this controversial field and to ensure that the work at NEL will embrace those aspects of the problem of most interest to industry. Much of the time will, it is hoped, be occupied by informal discussion, but a few papers will be presented to stimulate discussion. These include a survey of the existing state of knowledge as shown in published work, presented by NEL, papers by Mr. J. L. Gray of the Central Electricity Generating Board, and Dr. R. S. Silver and Dr. H. Simpson of Messrs. G. & J. Weir, and two short papers by NEL describing the experimental feedheater rig which is now being assembled, and a method of using a digital computer for designing feedheaters.

It is emphasized that, although much of the material discussed will inevitably be theoretical, the ultimate objectives are strictly practical. It is hoped that the Conference will attract engineers and others concerned with problems and developments in this important subject.

If members would like to have further information about the conference, please write to: The Director (Heat Division), National Engineering Laboratory, East Kilbride, Glasgow.

ASHRIDGE COLLEGE

Companies which are planning the educational development of their executives will be interested in the facilities offered at Ashridge College, situated near Berkhamsted—a stately house, with a long history, which has recently been equipped to the highest standards as a residential centre for courses of study in modern management. The governing body, whose chairman is Sir Hugh Beaver, K.B.E., LL.D., of Arthur Guinness Son & Co. Ltd., draws its members from prominent industrialists and public men.

THE 61st ANNUAL BANQUET

"EXPORTS and overseas trade are absolutely necessary, particularly as we in Britain lack mineral resources and have a high and concentrated population." So said Dr. Charles Hill, M.P., Chancellor of the Duchy of Lancaster, when he proposed the toast of the Institute of Refrigeration at its 61st Anniversary Dinner held at Grosvenor House, London, W.1, on January 25. Over 700 were present at the event, the highest attendance ever.

The Government did not need to be reminded of the important advances being made in the refrigeration field, said Dr. Hill. Their export figures, £200,000,000 in the last 12 years, reflected great credit on them, and he was sure that, despite the lack of resources, possessed by some competing countries abroad, we would win through with that greatest of all our national resources—the ingenuity of British science.

Relying on behalf of the Institute, the president, Engineer-Commander W. R. Sinclair, said that it had been 9 years since they last had the privilege of Dr. Hill's company at their dinner.

Referring to the work of the Institute, he said that it was a very agreeable body to belong to. "It is not large enough to be institutional, but is large enough to serve a wide range of interests."

The work of the Institute was continuing well, and they were mindful of many things of importance to the industry. They placed much emphasis on scientific education and to this end the newly erected National College of Heating, Ventilating,

Refrigeration and Fan Engineering was making a vital contribution.

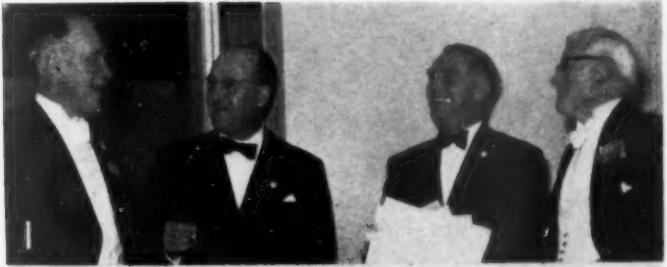
The council of the Institute was trying to create ways of increasing the range of what they were doing, and they were being successful. "I think it is worth mentioning," said Commander Sinclair, "that our fees have remained the same for the past 14 years."

One recent decision of the council had been to elect members from amongst their own body for the presidency from time to time. He announced that Mr. C. M. Brain had been elected for the next year.

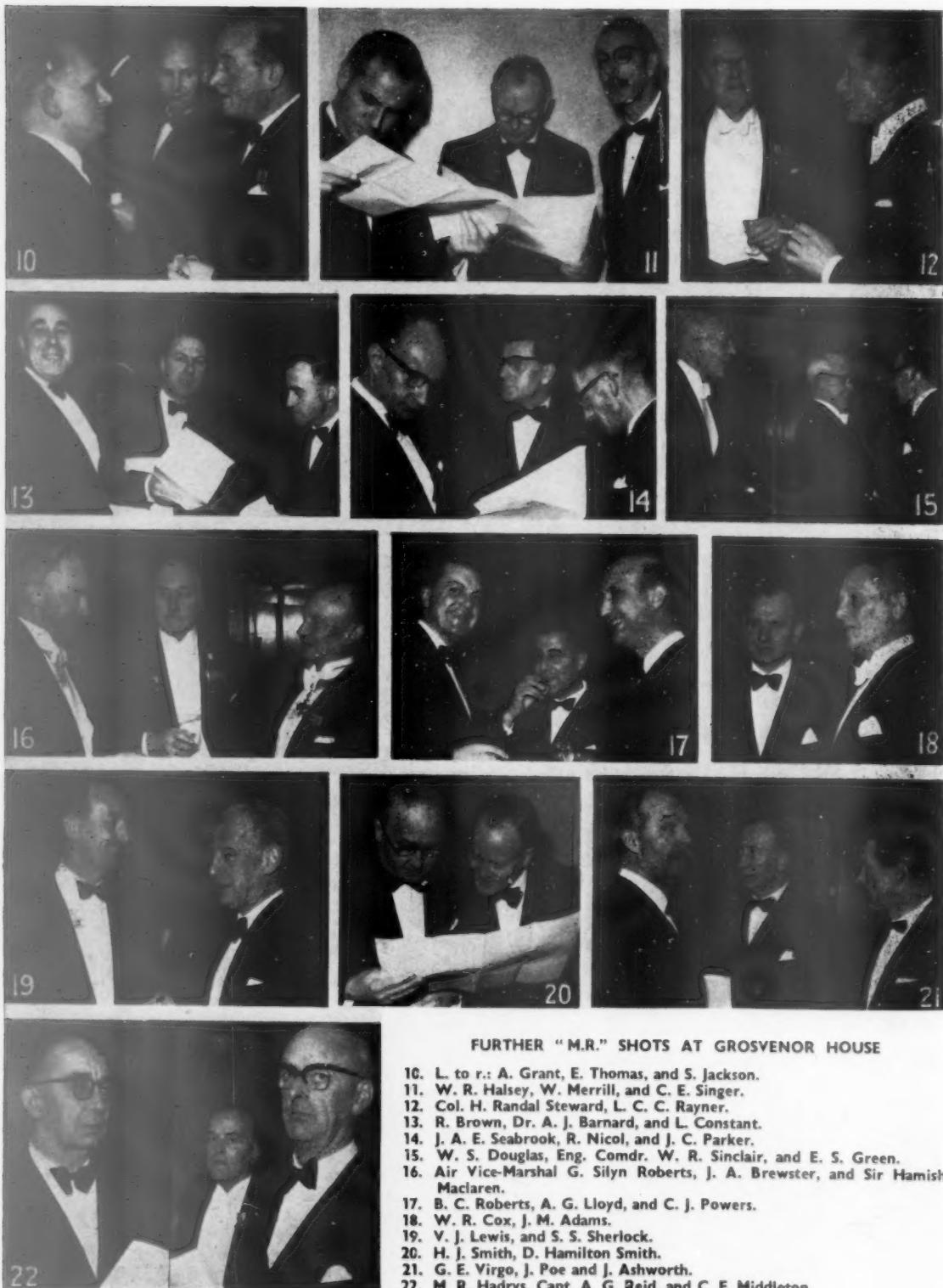
The guests were proposed by Mr. G. L. H. Bird, member of the council. Amongst those whom he welcomed especially were Dr. Charles Hill, Sir Hamish Maclarens, Vice-Admiral N. S. Henderson, Air Vice-Marshal G. Silynn Roberts, Dr. J. E. Garside, H. A. Secretan, G. S. Bishop, W. Maass, C. M. Marks, T. Whittaker, L. C. C. Rayner, and F. R. I. Gerrard. Mr. Bird made particular mention of the presence of Lord Dudley Gordon and said they were sorry that Sir Rupert De La Bere had been unable to be with them.

In an entertaining speech on behalf of the guests, Mr. H. A. R. Binney, director of the British Standards Institution, quoted G. B. Shaw to illustrate his remarks—"A reasonable man adapts himself to the world in which he lives; an unreasonable man attempts to adapt the world to himself. Therefore, progress depends on the unreasonable man."

Banquet Personalities



1. L. to r.: J. A. Brewster, J. C. Taylor, D. T. Lee and Engr. Comdr. W. R. Sinclair.
2. F. R. I. Gerrard, and C. M. Marks.
3. L. to r.: W. Maass, Dr. Ezer Griffiths, H. A. Secretan.
4. L. to r.: Dr. J. E. Garside, and G. L. H. Bird.
5. L. to r.: B. T. Smith, V. J. E. Smith, and S. B. Warburton.
6. L. to r.: A. Huntingdon, J. K. Gough, E. LeFre, E. W. Patrick, G. F. Leech.
7. P. R. G. Worth, A. S. Holman, D. H. Matthews.
8. J. L. Creegan, and I. C. Rigg.
9. W. J. W. Modley.

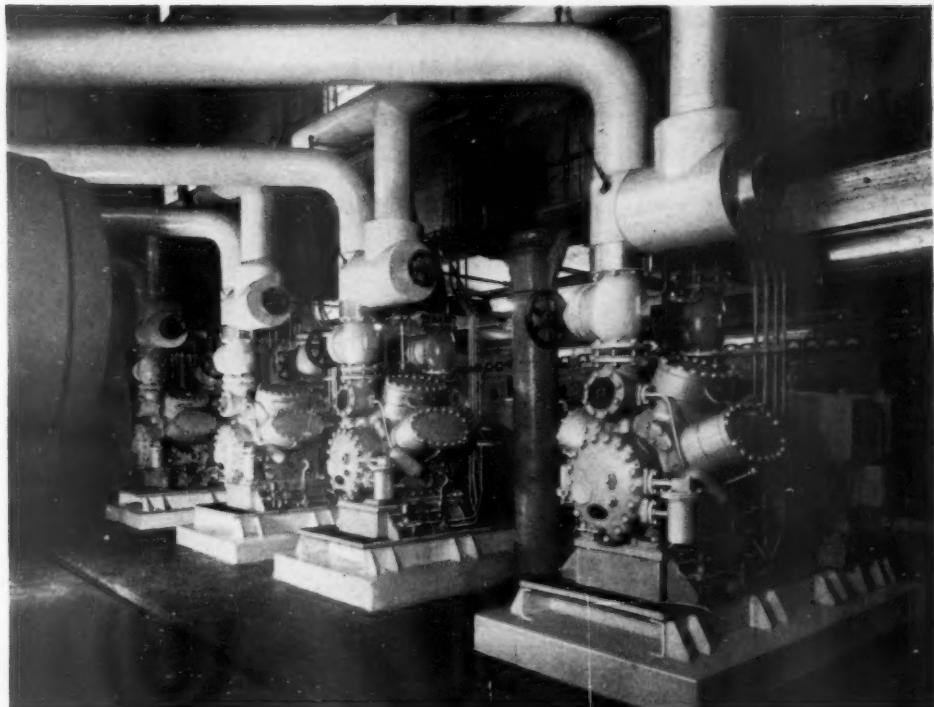


FURTHER "M.R." SHOTS AT GROSVENOR HOUSE

10. L. to r.: A. Grant, E. Thomas, and S. Jackson.
11. W. R. Halsey, W. Merrill, and C. E. Singer.
12. Col. H. Randal Steward, L. C. C. Rayner.
13. R. Brown, Dr. A. J. Barnard, and L. Constant.
14. J. A. E. Seabrook, R. Nicol, and J. C. Parker.
15. W. S. Douglas, Eng. Comdr. W. R. Sinclair, and E. S. Green.
16. Air Vice-Marshal G. Silyn Roberts, J. A. Brewster, and Sir Hamish MacLaren.
17. B. C. Roberts, A. G. Lloyd, and C. J. Powers.
18. W. R. Cox, J. M. Adams.
19. V. J. Lewis, and S. S. Sherlock.
20. H. J. Smith, D. Hamilton Smith.
21. G. E. Virgo, J. Poe and J. Ashworth.
22. M. R. Hadrys, Capt. A. G. Reid, and C. F. Middleton.

REFRIGERATION

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manufacturing
processes



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In brewing, for example, it plays a controlling part in all the processes. The illustration shows the four, 8-cylinder, 5" x 4" veebloc compressors, using ammonia as a refrigerant, supplied to Mann, Crossman & Paulin Ltd., Albion Brewery, London, E.C.1.

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SHOP REFRIGERATION NEWS



SMALL SHOPS WITH A FUTURE

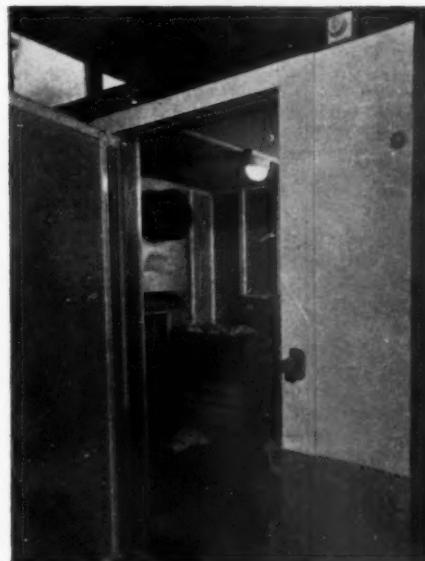
By Our Special Correspondent

WHAT a deplorable development is propaganda. Deplorable because it is so often lacking in integrity : it is a relentless force that should be regarded as suspect, and therefore resisted, by intelligent people.

Lately the propaganda hounds of destruction have been baying at the small retailers. The supermarkets are here. The small retailer is doomed. The greengrocer is already dead. A grocery trade journal actually had "Death of the Greengrocer" as a headline, and went on to say "The trade will pass to the grocer and the supermarket."



At the shop of D. G. Bull & Sons in George Street, Chatham, the Frigidaire frozen food cabinet is sited to allow customers to select from the pavement.



Behind the same shop there is a chill-room for fresh produce. This, as well as the cabinet, was installed by D. P. Toomey & Co., Ltd.

What arrant nonsense ; what irresponsible, scare-mongering ; what a complete lack of sense of proportion.

Of course the supermarkets (of which there are still only 400) are putting some of the small shops out of business—grocers in particular : there is little evidence that they have affected the fruiterers.

They will continue to put more small shops out of business because a great many women prefer supermarket shopping for groceries and provisions. But there are

SHOP REFRIGERATION

also many women who dislike the supermarkets intensely. There are also to be found housewives who prefer self-service, but not on supermarket scale. And there are also housewives who still prefer personal attention in a small-to-medium size shop on over-the-counter principles.

The best answer to the kill-the-little-man campaigners is the production of evidence that he is not only very much alive and carrying on business vigorously and successfully but also planning enthusiastically for the future.



In addition to this refrigerated window slab in the shop of M. Cook & Son, Manningtree, there is a frozen food cabinet facing the door. Both are Frigidaires installed by Girdlestone Refrigeration Ltd., of Woodbridge.

And this evidence is forthcoming here and now, in the lively examples shown in these pages.

The individual grocer is going ahead, mostly with, but sometimes without, the aid of the voluntary buying groups. The individual greengrocers, butchers, fishmongers are still modernizing their shops without the aid of groups. It is inevitable and all to the good that their numbers will diminish : all to the good if it means the disappearance of the scruffy, unhygienic, inefficiently operated little shops.

This is not an attack on the supermarkets. Good luck to them ; I hope to show a batch of them, adequately refrigerated, next month.

Meanwhile, let us look at some of the artificially respiration, temporarily resuscitated small shops. What a pity to bluff them into buying refrigerated cabinets or cold rooms if their days are numbered !

At Chatham there is a greengrocer's shop whose owner is far too busy to care a hoot how many (if any) supermarkets there are in the three Medway towns. Almost facing it is a tiny fishmonger's shop whose constant flow of customers on a recent Monday morning kept us waiting until lunch-time before we could get a "shot."

Both are open-fronted shops. Both employ two different forms of refrigeration. Both are the customers of D. P. Toomey & Co. Ltd., of Tunbridge Wells, Brighton, and Canterbury, Frigidaire distributors for the south-eastern counties.

The shop owned by D. G. Bull & Sons, is in George Street, and they have another shop in Military Road. At the George Street premises there is a Frigidaire cabinet on the right-hand side of the shop from which customers can be served without crossing the threshold. In the

fairly large storage area at the back of the shop there is more evidence of the progressive nature of this business : a cooling chamber with a capacity of 100 c.ft. held at a temperature of 40° to 42° F.

Having in mind the advice so constantly given to retailers to site their cabinets carefully out of draughts and sun, I feel bound to add that, in spite of its apparently vulnerable position, this cabinet does not appear to be affected by either.

In the fishmonger's shop on the opposite side of the road there is a Frigidaire cabinet for frozen foods and a refrigerated display slab, both backing on the right-hand wall. The latter is of the counter-top type, but in this shop it is supported on piers, faced with glazed tiles.

Between eight and 10 years ago there was a hot controversy among fishmongers on the relative merits of refrigerated glass-covered slabs and the refrigerated display cabinets. The last mentioned has certainly come into much greater popularity during subsequent years, though one does occasionally come across a covered slab.

An exceptionally interesting example is to be seen in the premises of Mrs. Froude at Maidstone, who runs a



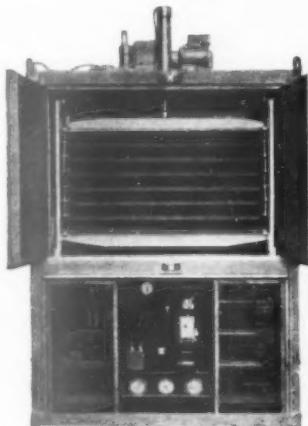
In this small grocer's shop of Mr. E. H. Jones, trading as The Essential Stores at Portslade-by-Sea, the two-Frys cabinet is so placed that there is access from both sides of the counter. Installation by Eddison Refrigeration of Hove.



A compact slab installation for Mrs. L. Froude at Maidstone. A Frigidaire installation by D. P. Toomey & Co., Ltd.

MODERN FREEZING-*FAST*

Pre-Cooked Foods, Vegetables, Poultry
Fruits, Meat and Fish

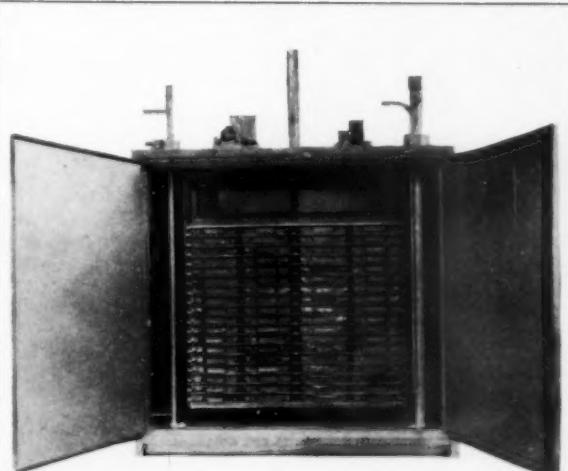


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FREEZING CABINETS FOR
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Jackstone Froster Ltd.

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Competitors are infuriating people. Their machines are always bigger and more modern than yours. Their production line is faster and more streamlined. No wonder they catch more business and make more money. Of course if *you* had more machines *you* would make more money too. Alternatively, if you had more money you could buy more machines. A vicious circle: but UDT can break it. UDT can lend you the money to buy the machines, and you can repay us with the extra money they bring in. Let's hear from you and we'll see what we can do.

UDT HELPS INDUSTRY TO HELP ITSELF

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combined wet and fried fish business with her two sons. The shop given up to the former is a very small one and the slab, which measures only 7 ft. by 3 ft. is refrigerated by a compact $\frac{1}{2}$ h.p. air-cooled plant. This is another Frigidaire installation by Toomey.

Another extremely small shop which has not been considered to be too small to accommodate a refrigerated display is that of Mr. Jones at Sheldale Road, Portslade, Sussex. Here the whole of the window space is taken up by an Iwo Frys cabinet and service has to be given from behind the counter. But it is, in fact, so sited that there is easy access for both the retailer and the customer. When a cabinet is installed in a window, however, I do think it is important that those responsible for the installation

shall point out that, unless its top surface is used to full advantage for two-way display, and effective use made of the back of it as a setting for window display, a cabinet thus placed gives the window a dull and neglected appearance from outside.

The last example comes from Manningtree in Essex—two cabinets in a small butcher's shop belonging to M. Cook and Son at 20, High Street. In this relatively small shop there is a frozen food cabinet facing the door and a refrigerated slab in the window.

R.S.A. NOTES

DISCUSSIONS on refrigeration controls dominated the recent brains trust meeting of the Refrigeration Serviceman's Association, held at the Danfoss premises in Queensway, London. With low temperature applications becoming popular, it was to be expected that questions would be asked concerning the suitability of T.E.Vs for this application.

A panel consisting of Mr. Hyams (J. & E. Hall) Mr. Bramzell (Lightfoot), Mr. Birney (Teddington Controls) and Mr. Minchin (R.E.M.S.), under the chairmanship of Lt.-Cdr. R. Ranken, gave their view on these matters. Concerning cross and straightforward T.E.Vs, members were advised to study the superheat tables when considering the merits of these valves.

Should a T.E.V. be situated inside or outside a refrigerated space? The panel agreed that the main problem here was moisture, and that less chance of its entering the system would exist if the T.E.V. was mounted outside the refrigerated space.

A reminder of a previous lecture came with the question of which side of a heat exchanger should a T.E.V. phial be fitted. The theoretical answer was given—"after the evaporator and before the heat exchanger."

"No" on sealed systems and "Yes" on semi-sealed systems was the reply to using charging valves and sight glasses on sealed units. This answer was discussed on the ground that the large number of sealed systems now being installed necessitated service in the field. This service meant the use of service valves and sight glasses.

Naturally following was the query of how to maintain the system as trouble-free from moisture as when sent from the factory. The coming type of molecular sieve dehydrator was advocated. A description of this dehydrator followed, showing that the difference in "Freon" and water molecules enabled the water only to be absorbed in the molecular sieve. Another favourable point was that there was no powdering of the drying agent to clog any strainers or sieves in the valves.

Will ammonia hold its own with the new refrigerants? Although slowly going out of favour, it was pointed out that it would be some time before it was finally replaced. "F-22" still had certain oil problems, especially in the low temperature range and in comparison to ammonia, and it was expensive.

Logically a question on oil recovery on "F-22" plants followed. The addition of 5 per cent. "F-12" in an "F-22" plant was quoted. This appeared to solve the problem with no adverse effect on the system.

Fitting of electrical contacts was another query. Members were advised that if contacts had to be cleaned, fine sandpaper and not files should be used for this purpose. Where 1 hp. fan motors operated low tempera-

tures, it was asked if a special type of capacitor should be used. It was advised that the makers be consulted to ensure a suitable motor was available for this purpose. Then followed advice regarding dash pots on contactors.

As crankcase oil was prone to get dirty, members were told that it should be changed periodically.

A discussion of the advantages of the rotary in comparison to the reciprocating compressor in small plants followed advice on the best type of flushing agent and so brought the meeting to a close.

The success of this type of meeting is assured and it is to be regretted that it is only possible to hold only one each session.

THE AIR-CONDITIONING MARKET

(continued from page 165)

main dealer for Carlyle Air Conditioning and Refrigeration Limited, London.

Following this statement he added that "with the benefits of American air-conditioning experience and with the increased concentration in Great Britain on comfortable and more efficient working conditions, the market is bound to develop rapidly."

Fuel Efficiency Company Limited have formed a new division, offering a comprehensive service, which will be responsible for marketing the whole range of Carlyle packaged-type air-conditioning units, together with equipment in the applied products range. Since 1945, when the company was formed, it has provided a service in the design, supply, installation and maintenance of automatic control systems for air-conditioning, space and process heating, ventilation plus the manufacture of complete control and instrumentation panels—an essential background to the correct application of packaged air-conditioning.

The appointment of Fuel Efficiency Company Limited is the first of many Carlyle are now making in developing its representation throughout the major centres of Great Britain.

In a recent article entitled "Growing acceptance of air-conditioning," the name of the Carrier Corporation of the United States is mentioned in reference to the manufacture and marketing of air-conditioning equipment in this country. We are informed by Carrier Engineering Co. Ltd. of 24, Buckingham Gate, London, S.W.1, that they are the proprietors in this country of the registered trade mark no. 429160 consisting of the word "Carrier" and registered in respect of goods that include air-conditioning equipment and they are, accordingly, the only company entitled to describe their products in Great Britain as "Carrier air-conditioning equipment."

COMMERCIAL AND INDUSTRIAL SECTION

Pressed Steel Co. Ltd., announce two important new appointments. With effect from January 1, Mr. D. A. Field became director and deputy general manager of the Prestcold division while Mr. C.V. Jones was appointed home sales manager. In his new capacity Mr. Field, formerly sales director of Prestcold, will have the overall responsibility for the sales of Prestcold products both at home and overseas. In addition, he will deputize as head of the division in the absence of Mr. K. J. R. Cocke, director and general manager, Prestcold division. Mr. Field's association with the refrigeration industry extends over many years, starting in 1946 when he joined Refrigeration (Birmingham) Ltd.—an important organization which held a franchise as Prestcold distributors. He contributed considerably to the development of this firm and became its sales manager in 1949, being appointed a director in 1951 and managing director during the same year. When the Pressed Steel Co. Ltd. acquired control in 1958 of Refrigeration (Birmingham) Ltd., which was subsequently renamed Prestcold (Midlands) Ltd., Mr. Field was appointed sales director for the Prestcold division of Pressed Steel. In his new post as home sales manager, Mr. C. V. Jones, formerly Prestcold's marketing manager—commercial refrigeration, will have the responsibility of all home market sales and supporting functions within the division. He will also play a big part in the further development of Prestcold's own distribution units which are being organized to sell the mounting output of the new Swansea plant. Mr. Jones joined Prestcold during 1950 as sales supervisor for their London branch.

* * *

An order worth £49,184 has been

Manufacturers' and Distributors' News

placed with Temperature Ltd. of London S.W.6 by Thermal and Plastics Industries (Pty) Ltd. of Durban, South Africa. It comprises 100 "Whispair," floor mounted, air-conditioners (the latest addition to the temperature range 100 "Temkon" medium temperature coolers, 50 "Temkon" low temperature coolers and 10 "Temkon" beer cellar coolers. A part of the order has already been shipped to South Africa and the remainder will be despatched by mid-March. At the moment, Thermal and Plastics Industries, who are the Temperature distributors for South Africa, are importing all units from England but it is anticipated that individual components, followed by complete units, will be manufactured under licence by them in the foreseeable future. A representative of Temperature Ltd. confirmed that there is a very large potential market for air-conditioning in South Africa. It is interesting to note that in South Africa quality and quietness of operation have now superseded price as the first consideration. In this respect the "Whispair" has been specifically designed to operate with the very minimum of noise, while providing perfect working conditions in offices, boardrooms, etc.

* * *

Mr. D. K. Fraser, joint managing director of **G. A. Harvey & Co. (London) Ltd.**, has been appointed managing director. Mr. H. E. Cooper has relinquished his office of joint managing director but remains a director of the company.

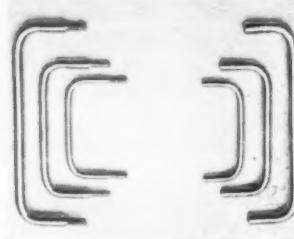
* * *

Henry Bucknall & Sons Ltd., announce that the construction of their new office and factory block is now completed and that the address and the registered office is Iberia House, Manor Grove, London, S.E.15. Telephone : NEW Cross 9611 (3 lines). Telegraphic address : Bucknall, Souphone. London.

* * *

A range of new cabinet handles has recently been produced specially designed to meet the requirements of the refrigeration and allied industries, by **Fenny Electrical Co. Ltd.** They are manufactured from mild steel bar with ends tapped or threaded and finished in high quality chromium plate and are supplied

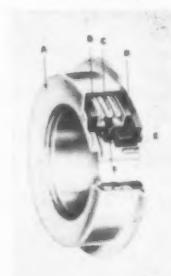
complete with either nuts or screws and washers to suit individual requirements. They are suitable for heavy industrial use as they can bear a considerable weight without any distortion.



A new mass-produced precision unit mechanical shaft seal has just been introduced by **Crane Packing Ltd.** of Slough. There are two versions of this seal, types 106 and 106A ; the former being a seal for applications such as fuel-oil, hydraulic and other positive displacement



Shaft seal, type 106: A, seal face driving dimples; B, precision-lapped sealing face; C, synthetic rubber bellows; D, metal ferrules; E, spring; F, driving sleeve; G, synthetic rubber drive ring.



Shaft seal, type 106A: A, seal retainer; B, metal ferrules; C, spring; D, precision-lapped sealing face; E, holding dimples; F, synthetic rubber bellows.



By Appointment to
Her Majesty Queen Elizabeth II
and the Royal Family
Pressed Steel Company Ltd.
London, England



By Appointment to Her
Majesty Queen Elizabeth II
and the Royal Family
Pressed Steel Company Ltd.
London, England

WHO makes the largest range of commercial refrigeration equipment in the country?

Prestcold does. And in every kind of business or trade where food and drink have to be kept cool, you will find Prestcold equipment hard at work. Prestcold keeps food fresh in the home; cares for temptingly displayed food in shops and supermarkets; enables hotels and restaurants to serve out-of-season food all the year round; gives farmers the means of getting fruit and vegetables crisp and fresh to market.

Every piece of Prestcold refrigeration equipment, standard or tailor-made, is a product of intense research, close attention to detail, and experienced engineering. If you have a cooling problem, bring it to Prestcold. Get in touch with your local Prestcold Branch or Distributor, or fill in the coupon below.

For fresh ideas it's Prestcold



To Commercial Sales Dept., Prestcold Division,
Pressed Steel Company Ltd., Swansea, Glamorgan.

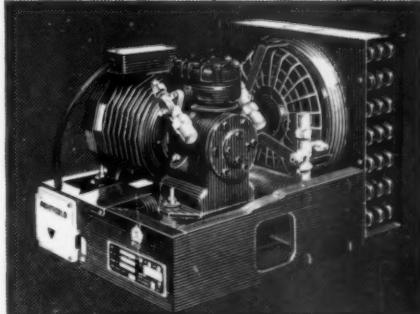
Please send me details of your refrigeration
equipment for.....

NAME.....

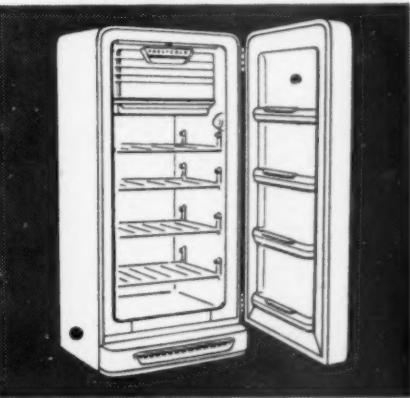
ADDRESS.....

M.R.I.

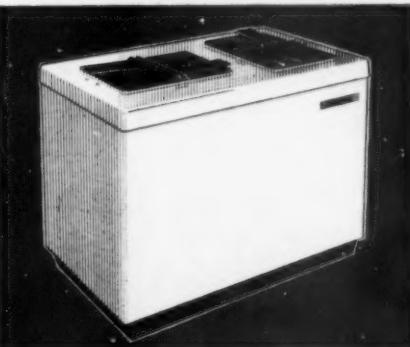
Just three from the
Prestcold range



Super Presmatic motor compressor. A direct drive motor compressor with no belts, shaft seals or flywheels to give trouble. It costs little to run and is produced in the range $\frac{1}{2}$ h.p. to 6 h.p. All the advantages of a hermetically sealed motor compressor, yet accessible for on the spot service.



SG 141 Service Cabinet. A 14 cu. ft. refrigerator that takes up only $2\frac{1}{2}$ sq. ft. of floor space. It has a chill tray for meat and fish, a 35 lb. frozen food locker, and two 30-cube ice trays. As a milk store it will hold 178 $\frac{1}{2}$ pints of bottled milk. Overall size: 65 $\frac{1}{2}$ in. high; 30 in. wide; 30 $\frac{1}{2}$ in. deep.



cc 132 Conservator. A compact, economical deep freeze for ice cream or reserve stocks of frozen food. 13 cu. ft. capacity.

'Arcton' travels



'Arcton' goes everywhere. It's not only Britain's best-selling refrigerant, but the choice of discerning users in Europe, India, Pakistan, South Africa, South America and as far afield as Hong Kong and Australia.

The reason is simple: for uniform high quality and constant performance the 'Arcton' range is unbeaten. There's an 'Arcton' chlorofluoro-hydrocarbon refrigerant for every use.

Literature and information are available on request.



GENERAL
CHEMICALS
DIVISION

Imperial Chemical Industries Ltd., London, S.W.1.

AR 55

pumps, deep and shallow well jet pumps, refrigeration compressors, small centrifugal water pumps, agitator shafts, etc. The type 106 seal is a press-in version of the type 106 seal and was first designed to provide a low-price highly efficient seal for the water pumps of motor cars. This version of the seal is also suitable for a wide range of domestic appliances in which mechanical shaft seals are used. The size range of the type 106 seal is $\frac{1}{4}$ in., $\frac{1}{2}$ in., 1 in. and for the type 106A $\frac{1}{4}$ in., $\frac{1}{2}$ in., $\frac{3}{4}$ in., 1 in. Both seals are designed for service at pressures up to 75 p.s.i. and temperatures up to 212° F. (100° C.). Users of mechanical shaft seals for mass-produced equipment where large numbers of seals are ordered at one time should send for information bulletin No. 22, which describes these seals.

* * *

The "Thermovitrine" system of double and multi-glazed units has been introduced into this country. This system comes from Belgium where it is used extensively in refrigeration cabinets by the leading makers including The Bell Telephone Company, Frigidaire, and others. It will be appreciated that the efficient operation of refrigeration cabinets depends considerably on the efficiency of the glass units employed. It is in this particular field that "Thermovitrine" has specialized in perfecting their system. In Belgium and other Continental countries, "Thermovitrine" units have stood the practical test of usage over a period of eight years, both in open and deep freeze cabinets and have gained a reputation for reliability throughout the refrigeration trade. Constructed on the basic principles of a cavity of dehydrated air between two sheets of glass and

hermetically sealed, units incorporate special features. These include the aluminium tube spacers between the glass and the special bonding mastic used. Both additional strength and finish of unit are achieved with the tube method, but the main factor responsible for the outstanding performance of "Thermovitrine" units is the unique properties of the mastic itself. Impervious to attack by water, oils or other organic matter, this mastic is produced exclusively by the proprietors of "Thermovitrine" units. Hitherto unobtainable in this country, "Thermovitrine" units and mastic are now being produced by North Western Lead Co. Ltd. of Hyde, Cheshire, who have acquired sole British rights for manufacturing. First British made "Thermovitrine" units have gone to Hyde Electrical Industries for use in their new refrigeration cabinets.

* * *

Work is now well advanced on another large modern building at the Cambridge Instrument Company's factory in Chesterton Road, Cambridge. Similar in appearance to the company's new research laboratories which it joins at one end, it will consist primarily of two floors supported at first floor level by a series of reinforced concrete pillars. The top floor will house testing, assembly and wiring departments and the top floor the company's Microscan X-ray analyser. The building, which is expected to be ready for occupation in July, adds 16,000 sq. ft. of floor space to the 20,000 sq. ft. provided by the research laboratories, opened in 1959. The building will be fully air-conditioned. The contract for the building is being carried out by Messrs. J. Jarvis & Co., to the

COMMERCIAL AND INDUSTRIAL

design of the architects, Edward D. Mills & Partners.

* * *

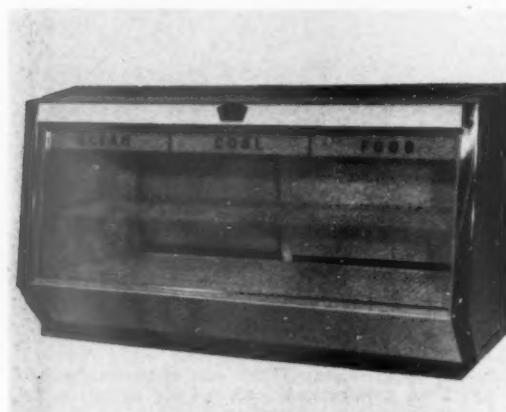
Westgate Engineering Co. Ltd., one of the George Elliot group of companies, have announced that a complete new range of frozen food cabinets, vision counters, counter tops, and display cabinets with additional storage, will be available to the United Kingdom quite soon. Westgate equipment is not entirely unknown to the trade as they have for the past two years manufactured specialist equipment for other companies. Under the trade name of "Westgate" all cabinets will be marketed through Gordon Sales & Service Co. Ltd., 314, Ladbroke Grove, W.10, who are in the process of arranging a dealer distributor organization throughout the United Kingdom, Northern and Southern Ireland. Mr. G. R. Woolgar, managing director of Gordon Sales, is joined in this new project by Mr. Frank S. Upton who was, until recently sales manager of Eldwood Ltd., Mr. Upton was instrumental in building the Eldwood Sales organization and is, therefore, fully conversant with the type of dealer policy required. Mr. Woolgar is quoted as saying that "The cabinets now being manufactured by Westgate are not only of high quality and economically priced but conform without exception to British Standards specification." This information is, of course, more than interesting to frozen food producers.

* * *

Mr. H. Underwood has been appointed sales director of **Lec Refrigeration Ltd.** and is now in full charge of the home and export sales department. Mr. J. W. Brown has been appointed managing director of **C.E.A. (Distribution) Ltd.**, Mr. G. H. Tagg managing director of **C.E.A. Group (Exports) Ltd.**, and Mr. B. E. Havard joins the board of the latter company. Mr. G. Goodey is appointed managing director of **Knighton Engineering Co. Ltd.** Mr. H. Underwood remains as chairman of the board of directors of the **C.E.A. Group of companies**.

* * *

The Darlington Insulation Co. Ltd. announces two new appointments to meet the needs of the company's continuing expansion. Mr. S. Watson has been appointed northern regional manager, responsible for supervising and co-ordinating the work of the company's branches in



Cabinet with double glazing as described above.

the north of England and in Scotland. Mr. A. W. D. Pullar has been appointed southern regional manager, with similar responsibilities for the company's branches in the midlands, south of England and Wales. The nation-wide insulation contracting activities of the company are carried on by branch organizations based on nine of the main industrial areas.

ELECTROLUX CABINETS

(continued from page 169)

£54 12s. 0d. (including £8 12s. 5d. p.t.). Paraffin £50 8s. 0d. (including £4 6s. 5d. p.t.).

Model L.37. Price : £56 14s. 0d. (including £8 19s. 1d. p.t.). TrayTop as an optional extra £2 0s. 0d.

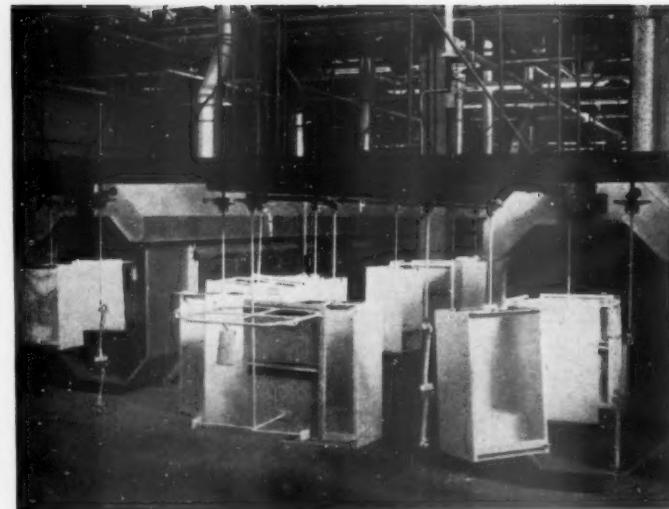
Luxury Model L.50 with 10 sq. ft. of shelf area, 5 c.ft. capacity. **Prices :** Electric or gas £96 13s. 7d. (including £15 5s. 4d. p.t.). Bottled gas £103 19s. 0d. (including £16 8s. 3d. p.t.). Paraffin £92 8s. 0d. (including £7 18s. 5d. p.t.).

Model L.76 with 14 sq. ft. of shelf area and 7.6 c.ft. capacity. **Prices :** Electric or gas £126 0s. 7d. (including £19 18s. 0d. p.t.). Bottled gas £134 8s. 0d. (including £21 4s. 5d. p.t.). Paraffin £123 18s. 0d. (including £10 12s. 5d. p.t.).

Oil India Limited have awarded Whessoe Limited of Darlington the contract for the supply and erection in Upper Assam of plant required to condition the crude oil before it is pumped through the 720 mile long pipeline from the Nahorkatiya oilfield to the new oil refineries at Nunmati and Barauni. The contract, which was the subject of international tender, is valued in the region of £900,000.

* * *

The installation recently completed by Parkinson Cowan Industrial Products at A.E.I.-Hotpoint, Peterborough, underlines the trend for manufacturers to use gas-fired radiant heat stoving equipment. Until two years ago, the stoving of refrigeration in this plant was handled by two electric ovens. Demand for A.E.I.-Hotpoint appliances increased and it was necessary to install two 15 ft. gas-fired radiant heat ovens. With the introduction of the "Iced Diamond," production was again stepped up and the factory premises extended. Two further P.C.I.P. ovens were installed with conveyors, water wash spray booths and electrostatic spray units. The two ovens involved in this second installation were a primer



The "exit" end of the Parkinson Cowan industrial products primer oven is on the right, the finishing oven is on the left.

coat stoving oven, 72 ft. long consisting of 144 panel units operating at 600° F., and a finishing coat stoving oven, 66 ft. long of 132 panel units operating at 450° F. As a result of experience gained from these installations it was decided to

have yet another infra-red oven. Parkinson Cowan Industrial Products again designed the plant in co-operation with A.E.I.-Hotpoint and manufactured the ovens, which are 27 ft. long and consist of 54 panel units.

New Covent Garden Market Scheme

INDUSTRIAL Development Group Ltd., a free association of 10 major engineering companies, has criticized the proposals contained in the Runciman committee's report for the reorganization of the Covent Garden Market on its present site, and has produced counter propositions of its own.

In its present form, the market

occupies 10 miles of kerbside. Eighteen hundred vehicles arrive daily from 4 a.m., and many of these have to wait until 10 a.m. before they are unloaded by hand. All arrivals and dispatches are by road causing congestion and delay, resulting in a loss of perishable goods.

The Runciman committee pro-

(continued on page 187)



Photograph of model showing approximately 1/10th part of the marketing centre proposed for King's Cross showing how road, rail and air service is directly available at the market.

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poses that new buildings be built on the same site, and the construction of an annexe for empties and bulk supply to lessen fire risk. Industrial Development Group object that this is only a half measure and constitutes no real solution to the transport problem.

They claim that a new market over the fan of railway sidings north of King's Cross Station can be built

without interruption of marketing activities, and that this would greatly relieve traffic congestion in Central London. The new buildings have been designed to allow the quickest possible transfer of goods. The roof of this proposed building would be flat, 1,200 ft. long and nearly 800 ft. wide, and so would be big enough for the running of a scheduled helicopter airline service.

Road, rail and water transportation would thus be available in one centre.

The estimated cost of the whole scheme is approximately £6,000,000. The man mainly responsible for its conception is Mr. Charles Glover, a former president of the incorporated Association of Architects and Surveyors, and of the World Engineering Conference.

Refrigeration Applied to Air-Conditioning

I.H.V.E. Paper

MOST modern types of refrigeration units require a fraction of the maintenance customary in the past. Attention which most equipment requires usually divides into day-to-day attention and regular adjustment and replacement of parts. Modern refrigeration units, even of substantial capacities, require little or no detailed operation provided they are equipped with the necessary controls. These points were made recently by J. A. E. Heard, B.Sc. (ENG.), M.I.MAR.E., M.I.H.V.E., M.INST.R., and N. F. Bradshaw, A.M.I.MECH.E., A.M.INST.R., when they presented a paper entitled, "Recent Developments in the Application of Refrigeration to Air-Conditioning," at a meeting of the Institution of Heating and Ventilating Engineers. In the course of their paper the authors stated :

Refrigerating equipment must be carefully selected for modern economical air-conditioning systems.

There are a number of points to be taken into account when considering applications and it soon becomes obvious that there is no one ideal type of refrigeration.

Among the principal factors to be considered are capital and operating cost, size, weight, complexity, driving medium, ancillary services required, maintenance and reliability. Invariably, for a particular application one type of machine will be the best all-round choice and for the moment at least this generally falls between one or other of the following :

- (a) Centrifugal compressor sets chilling water and brine.
- (b) Steam jet particularly in the marine field chilling water.
- (c) Reciprocating compressor sets on direct expansion or chilling water.
- (d) Lithium bromide absorption units chilling water or directly cooling the air.

Perhaps one of the most difficult problems in the selection of refrigeration equipment is to be sure that all factors which affect cost are truly evaluated ; not only the capital cost but all associated indirect costs and operating costs, including staff requirements and part-load efficiencies.

The determination of "capital cost" is a fairly straightforward business but it can involve a great deal of work assembling a number of alternative prices and invariably indirect costs, such as associated

builder's work and structural requirements, are never fully analysed.

The prediction of "operating cost" is by no means as straightforward as it involves a host of variables ranging from seasonal tariffs for electric power, steam-raising costs, pumping costs, staff requirements and maintenance charges.

Fully automatic capacity modulating refrigerating equipment now provides the flexibility necessary for modern air-conditioning systems. Customers expect plants to take care of changes due to the weather with the minimum of attention and maintenance.

All types of refrigeration machines can now be applied in this way and improvement in design of basic refrigeration controls, such as expansion valves, has made stability at all running conditions possible. Reliability has become an accepted feature of a well-engineered project and the development of specialized refrigeration controls, together with the non-toxic refrigerants, has stimulated the application of direct expansion air cooling coils for both industrial and comfort conditioning duties.

The principal advances in application of refrigeration might be summarized thus :

- (1) Units have been developed which are more compact and weigh less.
- (2) Factory-assembled refrigeration equipment has reached a high degree of development and expensive site work is reduced.
- (3) Extended surface air cooling coils obviate water circuits on smaller applications.
- (4) Automatic operation with comprehensive range of reliable controls have reduced operating costs.
- (5) Improved design of component parts has reduced maintenance and replacement costs.

An essential feature of most air-conditioning systems is their ability to function under varying climatic conditions and internal load changes. This means that the associated refrigerating machinery must be capable of varying output and, when using direct expansion air coolers, they must be so contrived as to perform satisfactorily whether on part or full load.

This is probably easier said than done since it is necessary to avoid air temperature stratification, ice formation on the coil surface with the obvious

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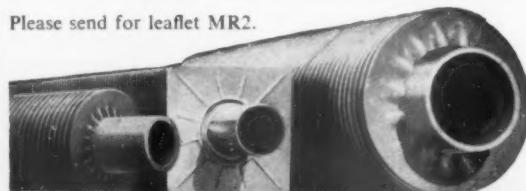


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restriction so caused, oil logging of the coil refrigerant vapour path and liquid refrigerant slugging back on to the compressor suction valves.

As the refrigeration engineer will know, the hydro-carbon refrigerants are miscible with oil and a proportion of this oil continually circulates round the system. Provided circulation is maintained, compressor oil starvation is avoided, but since the oil separates out in the evaporator it is necessary to ensure that gas velocities are sufficiently high at all times.

Where close dewpoint control is required, the control point of the main pressure valve may be raised by pilot devices so as to elevate evaporating pressures at part load, and so compensate for the lower transfer temperature differential. Precautions must be taken in such cases against excessive compressor cycling at minimum loads.

When inter-connecting compressors, special consideration must be given to the lubrication of units and the layout of the suction and discharge piping is also most important. An oil balance connexion at low level ensures that an adequate quantity of oil remains in each compressor crankcase at all times and a large pressure balance connexion at high level to obviate pressure differences which would upset these levels.

Hot gas reheat is a technique used with vapour compression refrigeration when applied to industrial air-conditioning duties which require low relative humidities and comfort dry-bulb temperatures. In such plants it is necessary to reduce the dewpoint of the supply air in the central apparatus well below the sensible cooling requirement and then reheat it before distribution within the conditional area.

This reheating is possible without the expenditure of additional energy by means of an extended surface air to refrigerant condensing coil installed in the supply ducting. Thermodynamic balance under all load conditions is not, of course, possible and a subsidiary external condenser is located in series in the refrigerant circuit. Side and face dampers on the condensing coil provide means of regulating the amount of reheat where this is likely to be more than adequate and supplementary air heaters are used where this is not likely to be so.

On the majority of larger air-conditioning installations it is desirable to use a secondary refrigerant for reasons of economy, load diversity, operating flexibility, installation and control simplicity.

Usually water is the most convenient medium and a chilled water circuit is provided so that a number of independent air-conditioning plants may be served by one central refrigeration installation.

When reciprocating compressors are used on chilled water applications the non-flooded evaporator is generally favoured these days. This type of evaporator has superseded the earlier flooded type shell and tube evaporator in which the refrigerant surrounded the water tubes, and it is the refrigerant which now passes through the tubes.

Application should be confined to closed chilled water circuits where fouling is avoided because water circulation is through the shell side of such units and cleaning is difficult except chemically.

The advantages of non-flooded evaporators lie in a reduced refrigerant charge-reduced tendency to freezing and simplification of oil return.

PLANS AND DEMANDS

AIR-CONDITIONING equipment in industry, in offices and hotels and in transport is certain to be installed in an increasing number of cases over the next few years, states the journal *Engineering* in a recent survey.

A valuable summary of improvements that could usefully be made in present air-conditioning plant came from Associated Electrical Industries Electronic Apparatus Division, Leicester.

There was scope, said the division, for:

"Improved forms of filtration media requiring less maintenance and lower replacement costs."

Cheaper forms of plenum ducting, particularly for those with acid and chemical resistance.

Cheaper and better means of incoming air diffusion and better control of temperature."

The A.E.I. Electronic Apparatus Division has spent £50,000 on air-conditioning equipment for its works over the past five years and was anticipating spending another £20,000 in the near future.

Standard Test Urged

From the Carborundum Company, who had put £23,000 into air-conditioning at their Trafford Park works, Manchester, and have further plans for more installations, came the suggestion that there should be more general use of self-cleaning primary air filters.

Many firms expressed satisfaction with the equipment they have used. The Appleby-Frodingham Steel Company made the point that in the steel industry the equipment for

IN AIR-CONDITIONING

air-conditioning should be robust and generously rated to allow it to cater for fairly wide fluctuations in operating load.

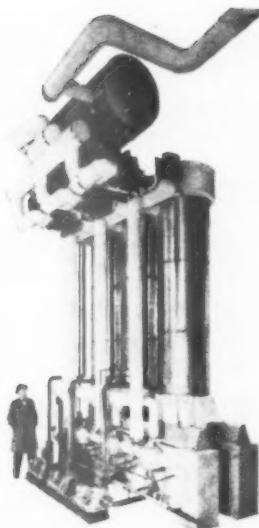
The Ferranti Company would like to see "more reliable control equipment."

It also made the proposal that all air filter makers should use the same efficiency tests—B.S.S. 2831 : 1957. Ferranti were speaking from experience. In the last five years they had spent £58,000 on air-conditioning equipment for their works. £16,180 was being spent this year on installations, and there were schemes to invest another £31,300 on installations in the future. All this, the company pointed out, was for full air-conditioning and did not include plenum plants or clean air vent systems. The cost of providing suitable buildings had also been excluded from these costs.

Honeywell Controls Limited, of Greenford, Middlesex, having spent £8,000 on air-conditioning the works prior to last year, put in general air-conditioning plant worth £5,000 in the course of 1960.

There was undoubtedly a cautious attitude abroad in parts of industry to the whole subject of air-conditioning. Some firms wrote to say in effect—"apart from fume extraction, and ventilation when the heating is on, we don't need it."

Some idea of the commitment of heavy engineering to air-conditioning was given by the figure of £154,000 invested by C. A. Parsons, the Newcastle upon Tyne turbine manufacturers, during the past five years.



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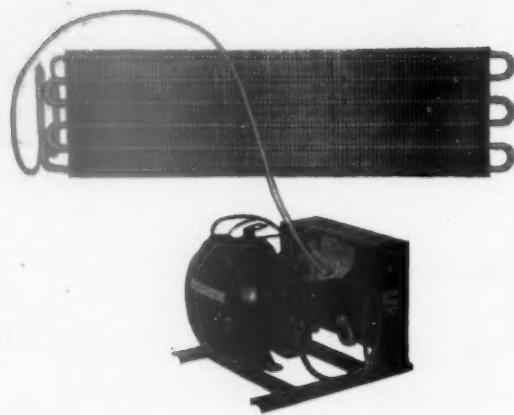
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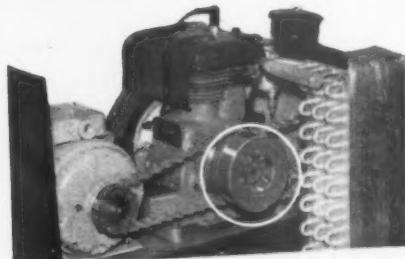
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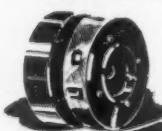


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Refrigeration of Foods

NEW TECHNIQUES ARE BEING DEVELOPED

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THE American Army has recently introduced quick-serve meals in a feeding system designed to keep ahead of military needs during atomic warfare, whatever form this may take. In this system, great dependence is placed on use of freeze-dried meats.

Freeze-drying Ups Quality

Here are six advantages of freeze-drying as the main source of supply, according to R. G. Tischer and M. C. Brockmann, Quartermaster Food and Container Institute for the Armed Forces, Chicago:

- 1) Preservation without refrigeration.
- 2) Weight reduction—dehydrated products average only one-third the weight of the original foods.
- 3) Acceptability—taste of freeze-dried items (after rehydration) generally is comparable to that of the fresh product. This is particularly important with meats.
- 4) Appearance—undesirable colour changes are minimized.
- 5) Handling economy—packaged in flexible film, freeze-dried products enable considerably better space utilization.
- 6) Operational efficiency—preparation and service in the field require a minimum of equipment and no specially trained personnel.

Drying takes place by evaporation or, more precisely, by sublimation of water from the ice phase. Freezing under high vacuum is the key to most of the technique's advantages. Rigidly frozen material does not shrink. Moisture is lost from the outer surface, leaving a cork-like porous product with hollow spaces. This porosity greatly speeds rehydration.

As Tischer and Brockmann pointed out, freeze-drying is substantially more expensive than conventional procedures. Equipment is costly, especially in terms of product process per day. Since freeze-drying does not produce shrinkage, a serving of freeze-dried meat has the same volume as one of canned meat. However, it weighs only one-third as much.

On the basis of values summarized, cost of freeze-dehydration is quickly recovered by savings in air transport. In rail shipment, weight reduction incident to freeze-drying cannot be expected to return more than one-half the cost of freeze-drying. Transport by boat is relatively insensitive to this weight reduction.

The unique advantages of freeze-dried products for military feeding have limited counterparts in the civilian market, where freeze-dried items must compete against fresh and quick-frozen products.

Ultra-high-frequency Radio Energy for Frozen Foods

When a material that contains water is frozen and placed in a vacuum chamber, the ice crystals in it sublime, i.e., turn directly into water vapour without melting to water. A considerable amount of heat (heat of sublimation) though is required to evaporate the ice crystals. This heat must reach the centre of the material, and in the case of most foods the evaporation of crystals near the surface forms a layer of cork-like stuff that is an excellent insulator. It keeps heat of sublimation from reaching the interior unless the surface temperature is raised so high that the food spoils.

As Dr. A. Copson of Raytheon Manufacturing Co. has shown, it is possible to get around this problem by putting frozen foods in a vacuum chamber and shooting through them a powerful blast of ultra-high-frequency radio energy. The waves agitate the molecules in the interior of the food and generate just enough heat to make the ice crystals turn directly into water vapour. If the job is handled properly, the food loses up to nine-tenths of its weight and turns into a brittle sort of substance while staying far below the freezing point. Chemical changes, which would damage flavour cannot take place. Even unstable vitamins are preserved.

Raytheon regards this new process as experimental. It does not know yet how long freeze-dried foods will keep at room temperature. They can be stored in plastic envelopes filled with nitrogen to prevent oxidation, but in the case of meat that contains fat there may be a tendency to deteriorate with time.

Immersion-freezing of Poultry

Scientists of Purdue University, Lafayette, Indiana (J. D. Mitchell, J. W. Dodge, W. W. Marion and W. J. Stadelman) have found two prime advantages of immersion-freezing for poultry: 1) Sure Quality control—birds retain their attractive white appearance, the one quality factor the consumer can really judge before purchase,—and 2) Higher operating efficiency—freezing takes place right in the liquid heat exchange medium, which has a higher heat-transfer coefficient than air; in addition, the method lends itself to a line-type operation.

All birds used in the freezing study were subscalded, dressed, eviscerated and cooled to 35-37° F. in slush ice before being vacuum-packed in heat-shrinkable film. At comparable temperatures, saturated sodium-chloride solution transfers heat about twice as fast as 45 per cent. ethylene glycol. Brine is highly

TO FREEZE QUALITY BIRDS ECONOMICALLY

Circulate brine			For best freezing rates		
Velocity ft. per min.	Freezing time, 1/2-in. depth (min. at 0° F. and 10° F., respectively)		Freezing time, Various depths (min. to 1, 2, 3 in., respectively)		
0	50	88	120	260	672
52	39	44	104	218	301
84	29	34	82	181	245

corrosive and starts to "salt out" at -4° F., but is relatively cheap and readily available. In commercial freezing, propylene glycol would be used instead of ethylene glycol, which is toxic. However, their heat-transfer rates are about the same. Glycol does have an advantage over brine in that it can be used at much lower temperatures.

How Long Can Frozen Foods be Kept?

How long can various frozen foods be held before change occurs in appearance or deterioration starts?

It depends on the temperature at which frozen foods are held, and also on the product itself. Some items, like sweet corn, will retain full quality and appearance for two years at 0°. The following frozen-food life span table has been prepared by the U.S. Department of Agriculture.

Product	Temperature		
	+10° F. months	0° F. months	-10° F. months
Poultry, giblets	...	1	3-5
Poultry, roasting	...	4	8-10
Pork sausage	...	2	4-6
Pork roasts	...	4	8-10
Beef roasts	...	6-8	16-18
Lamb	...	5-7	14-16
Lobster	...	3-4	8-10
Cooked shrimp	...	3-4	8-10
Fatty fish	...	4	6-8
Lean fish	...	6	10-12
Mushrooms	...	3-4	8-10
Corn-on-cob	...	4-6	8-10
Asparagus, snap beans	...	4-6	8-12
Peas, cauliflower, spinach	...	6-8	14-16
Squash, pumpkin, carrots	...	12	24
Peaches, Apricots in paperboard cartons	...	3-4	8-10
Raspberries, without sugar or syrup	...	6-8	12
Raspberries, with sugar or syrup	...	8-10	18
Sliced strawberries	...	8-10	24

Electronic Refrigeration

Westinghouse Electric Corp. announced that electronic refrigeration may soon become a commercial reality. This means: silent, vibrationless refrigeration with no moving parts may be at hand.

Refrigeration by electronics was discovered by Peltier in 1834. The principle is that simply passing

electricity through junctions of two dissimilar materials creates heating or cooling depending on the current's direction. Previously, the process required apparatus as bulky as an ordinary refrigerator compressor to produce the smallest amount of ice. The new technique described by Westinghouse requires 50 per cent. less apparatus than conventional compression methods to gain the same results. A refrigerator with a 10 c.f. capacity would have that capacity increased by 10 per cent. if it was changed from compressor to electronic operation.

The electronic method is small-sized, noise free and vibration free, simple to control, capable of almost instant temperature change at the junctions and reversible. The same current that produces cold can produce usable heat for cooking and heating. Westinghouse, e.g., has developed a device that both cools and heats a baby's bottle automatically, and a mobile hostess cart with both refrigeration and oven compartments. (Neither are available commercially at present.)

Modern Equipment for Freezing

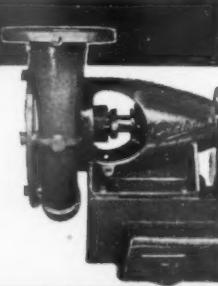
Food Engineering magazine, in a survey on refrigeration and freezing equipment mentions a series of modern equipment. The latest refrigeration compressors include multi-cylinder V/W types and rotary boosters; they combine high efficiency with important savings in weight and size, particularly for low-temperature operation. Reciprocating compressors have improved valves, bearings and lubricating systems that enable about 10 per cent. higher operating speed. Absorption-type refrigerating units, which eliminate use of compressors, operate economically with exhaust steam or other low-cost heat source.

Radiant cooling, a relatively new procedure, involves radiation of heat from a product to a special surface. Overhead freezing conveyors, equipped with baskets or hooks, efficiently handle smaller volumes of frozen goods. Spiral-belt freezers, originally designed for baked goods, are now equipped to handle poultry, meats, fish and ice cream. Belt tunnels are finding wide application in loose-freezing of produce. One such unit handles corn at 4,000 lb. per hr., and peas at 5,000 lb. per hr.

PUMPS

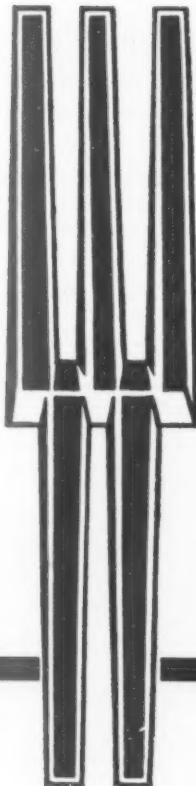
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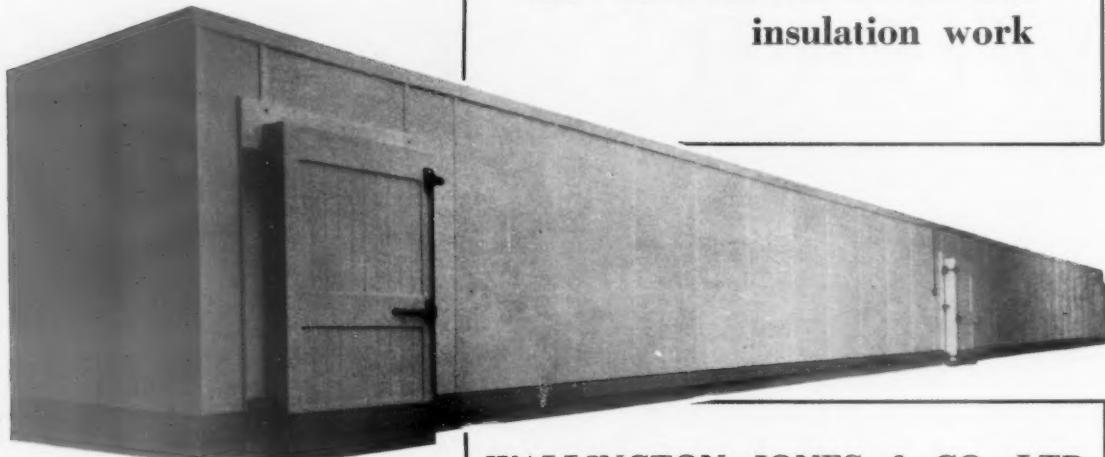
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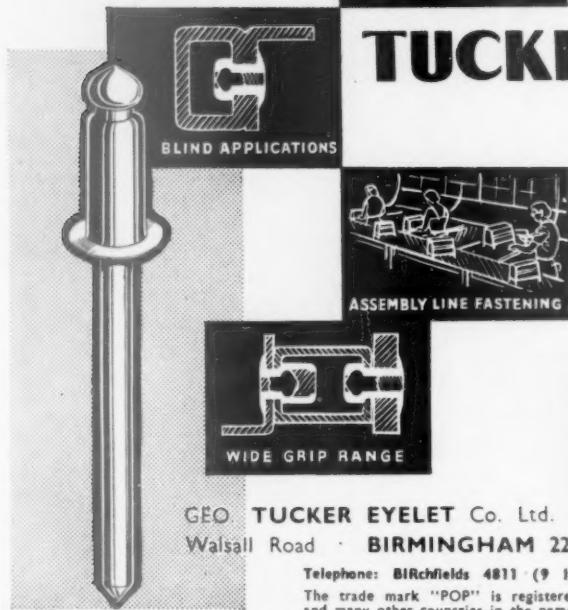
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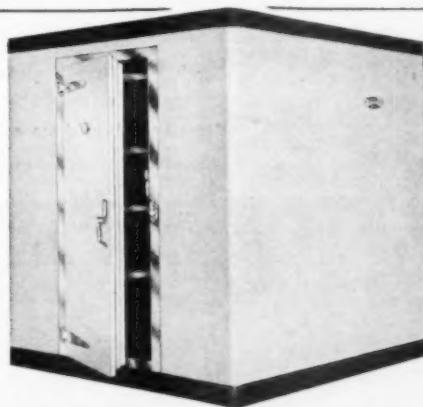
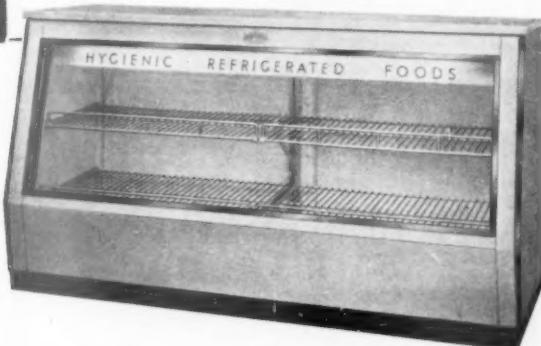
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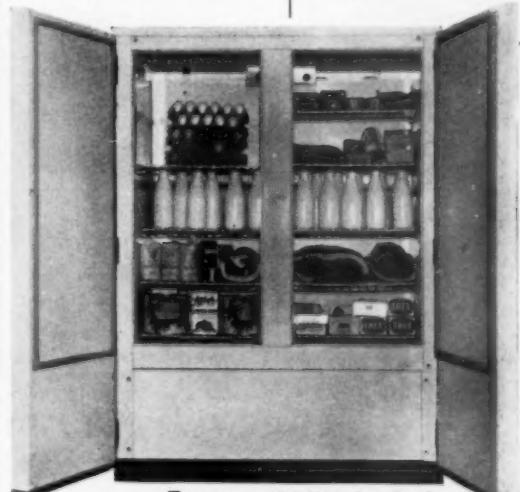
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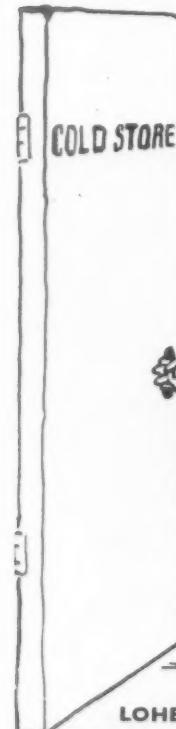
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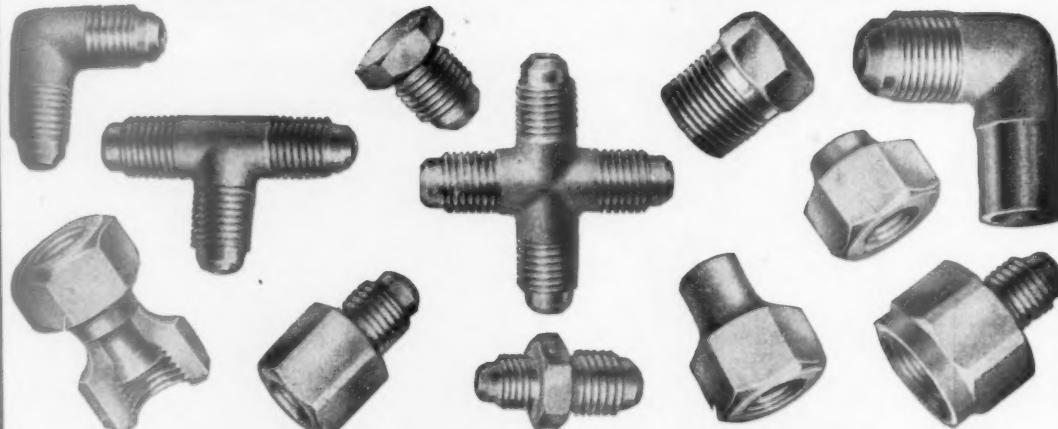
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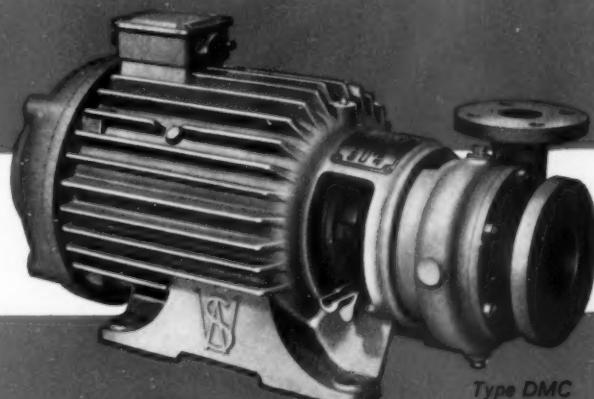
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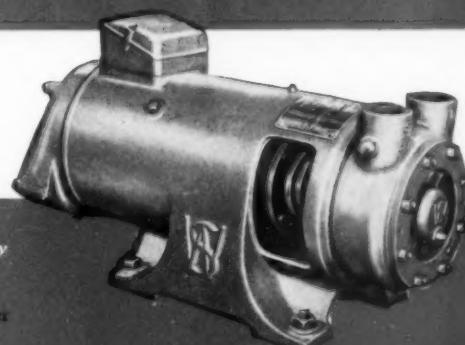
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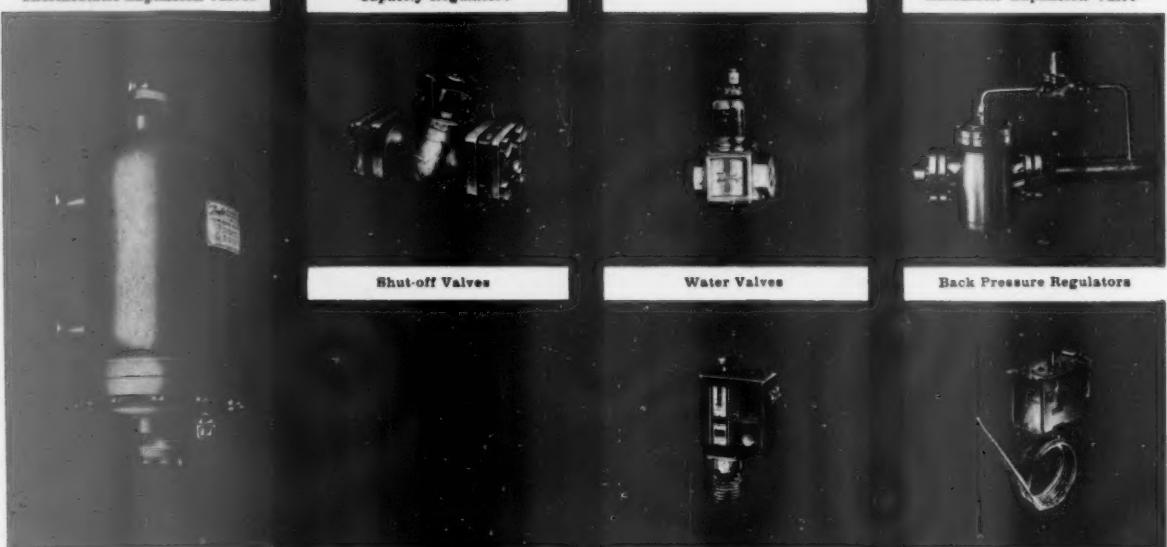
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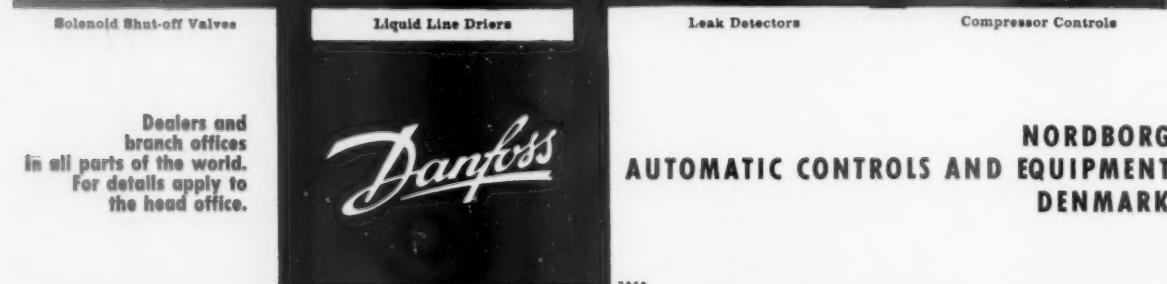
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